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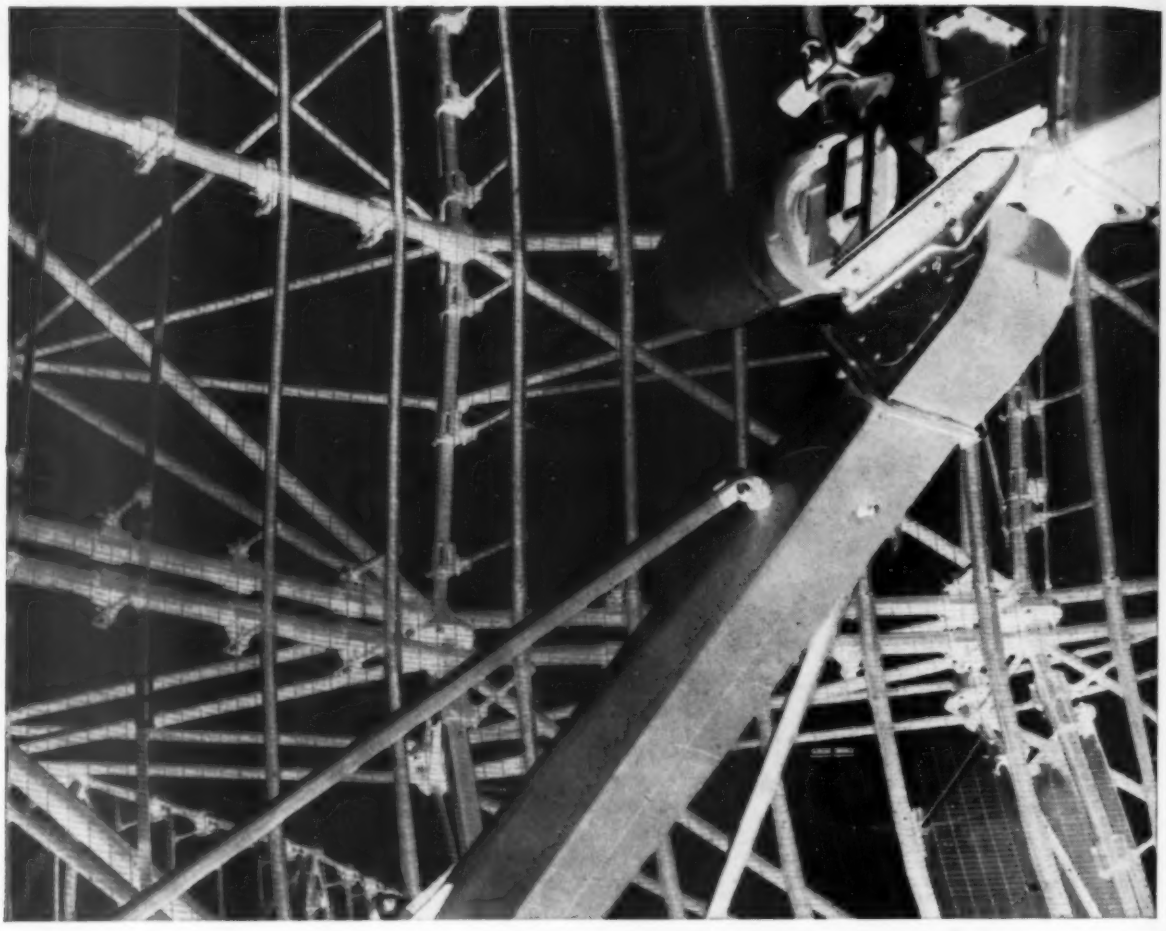

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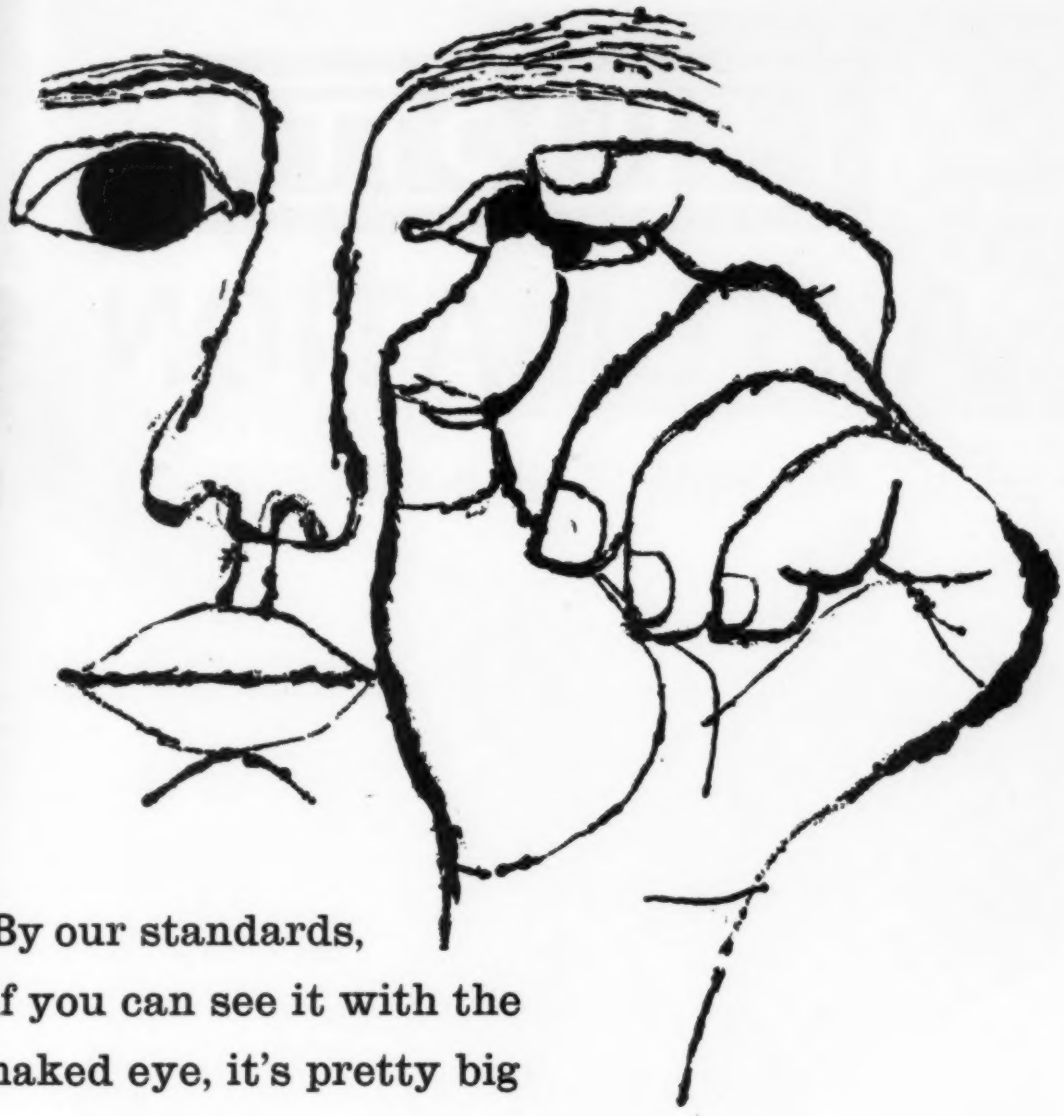

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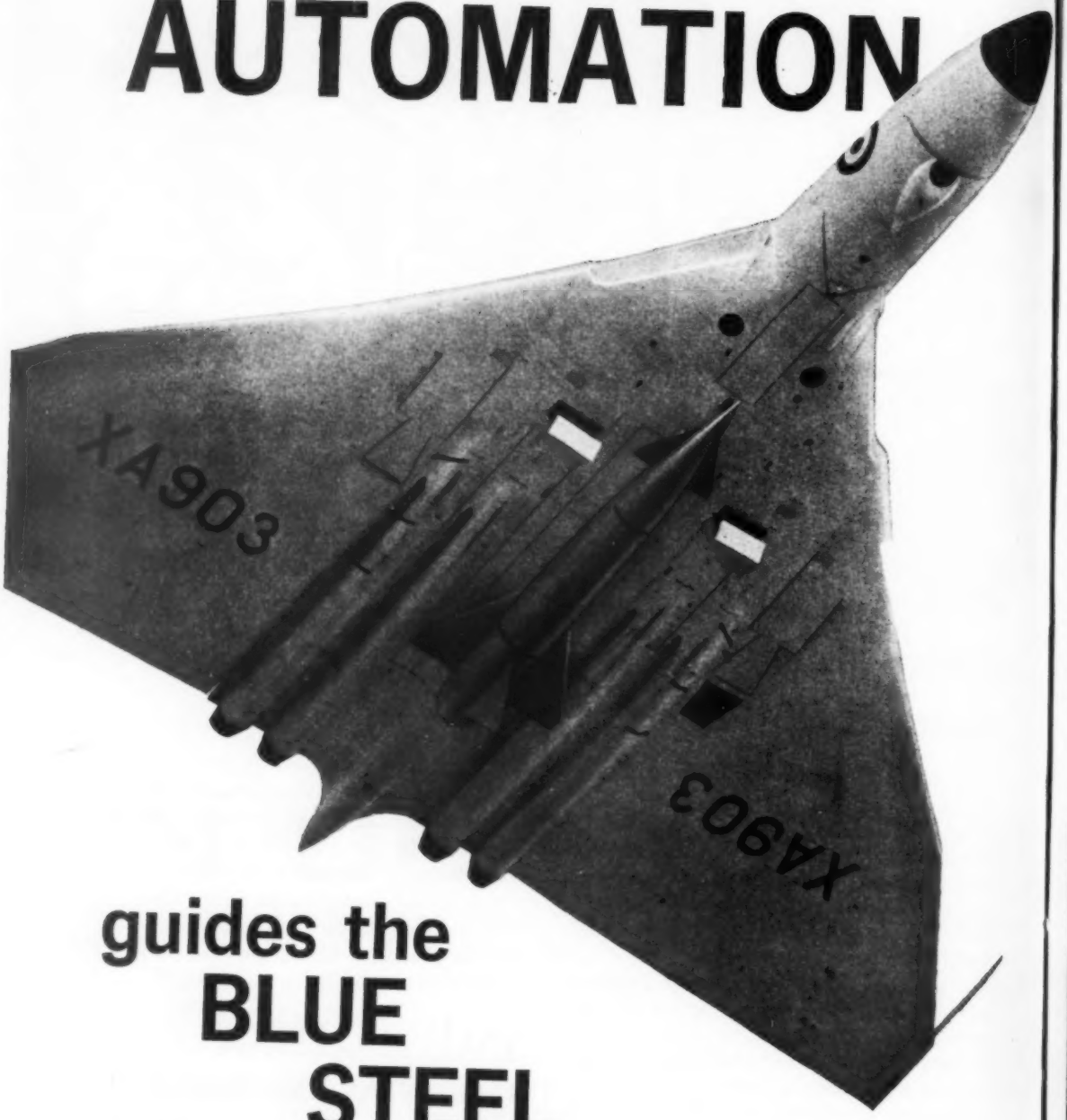

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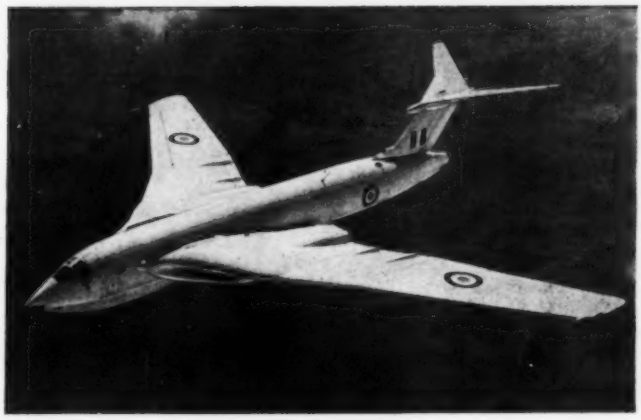

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Above is the Handley Page Victor B2, which together with the AVRO Vulcan forms Britain's Blue Steel carrier team.

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The use of Elliott inertial navigation system in Blue Steel is important not only in its demonstration of the advance position which Elliotts hold in this particular sphere. As speeds and altitudes reach the point where conventional navigation aids become outmoded, the information that Elliotts gain from their experience in missile work helps and hastens the development of similar systems for aircraft, in applications as diverse as automatic pilots, integrated fuel flow systems and automatic testing. Work by Elliott scientists goes on constantly, seeking ways to decrease the cost and size of such equipment—factors which will make a vast contribution to the safe and economical operation of commercial aircraft.

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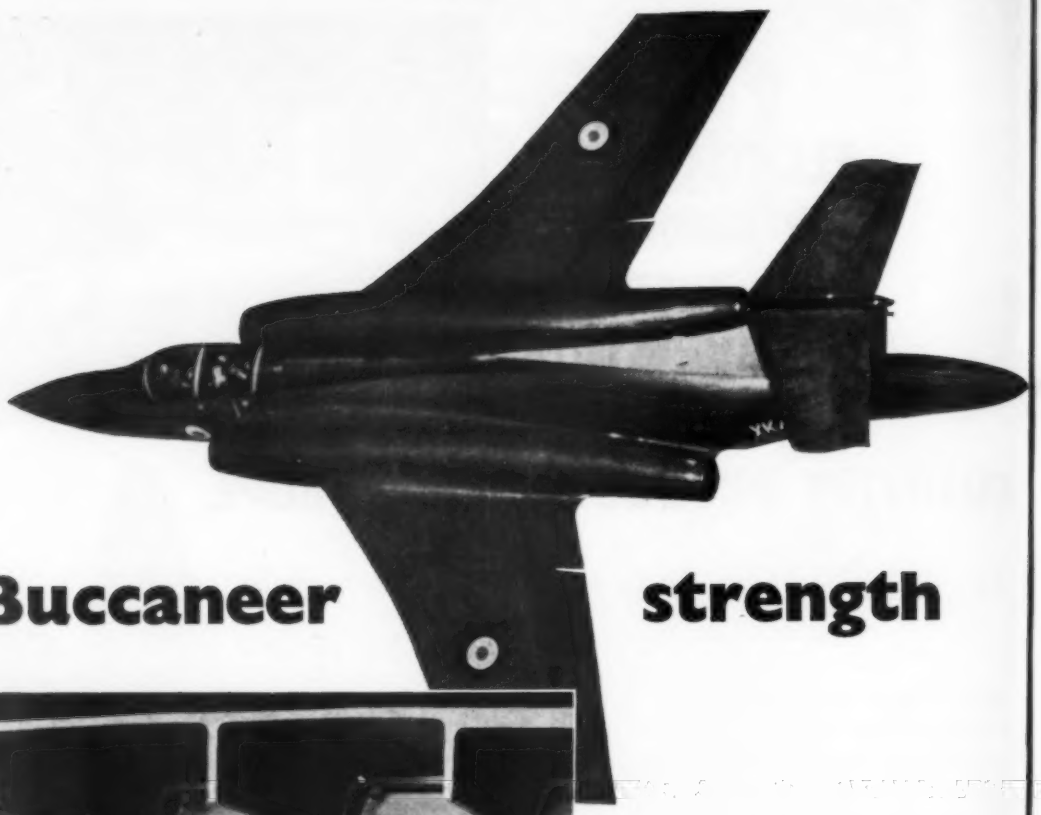
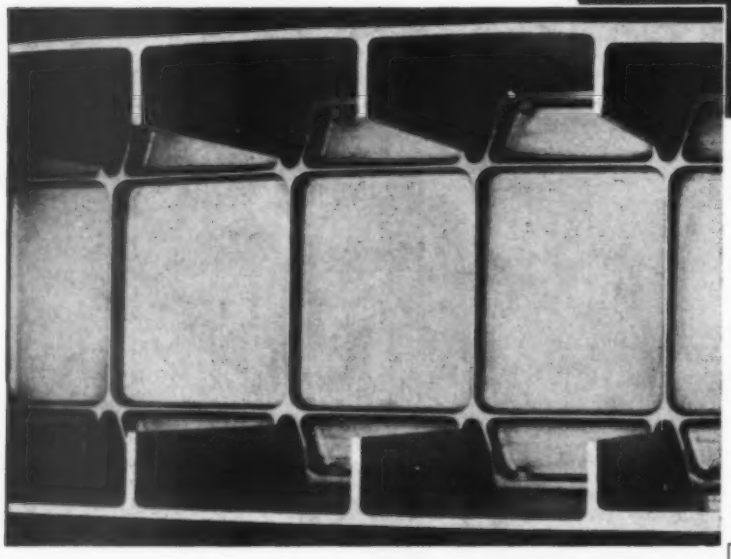
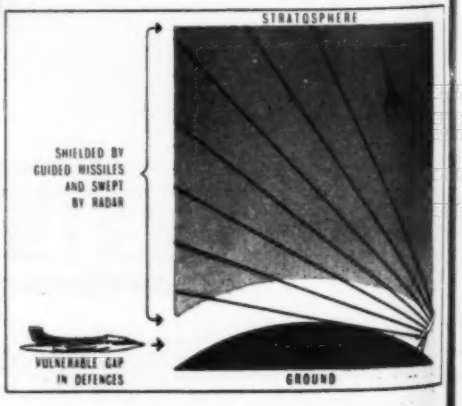


Buccaneer strength



An example of Blackburn integral construction

High-speed, low-level operations demand that the Buccaneer aircraft have great structural strength and stiffness combined with a long operating life. Integral construction of the Buccaneer ensures stiffness but, in addition, Blackburn engineering has built in the long-life factor.



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No 2708 VOLUME 79 FRIDAY 3 FEBRUARY 1961

FLIGHT

AIRCRAFT, SPACECRAFT, MISSILES

Official Organ of the Royal Aero Club First Aeronautical Weekly in the World Founded 1909

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Include Us Out

A PARTICULARLY significant contribution by a respected American correspondent is printed on pages 143-144. The subject is America and the supersonic airliner, and we have appended the sub-title " 'Include Me Out,' says Don Adams." There is cold comfort in what Mr Adams has to say. Cold for himself, for the USA, for Great Britain, and potentially for human society. What has happened is that the US Government has indicated its willingness to subsidize the development of a Mach 3 commercial transport. Of such an aeroplane Sir George Edwards has lately said that if the USSR decided that they wanted to make an all-out attack on the airline and aircraft manufacturing industries of the West, then the cheapest way in which they could bring chaos to both would be to produce a so-called supersonic transport flying at an alleged 2,000 m.p.h. [Mach 3].

As things appear to have turned out, it is not the Russians who have panicked the Americans: it is the Americans who are stampeding themselves, and perhaps other nations, in a frantic effort to make work for their aircraft industry.

Without ascribing to Sir George Edwards oracular propensities, we find it impossible in the present context not to recall another of his recent utterances. It was this: "By virtue of a lot of concentrated work the British just about know how to do the slower one [Mach 2] and I think have every intention of doing it. The Americans could undoubtedly find out how to do it. Neither of us knows how to do the 2,000-m.p.h. one [Mach 3]."

Lurching into the Future

But there is a further profound significance here for us in Britain. When Sir George expressed his views—as recently as last November—he had just returned from the USA, where he had put the proposition that both the supersonic transport and international collaboration were good things. He had found the Americans "not unsympathetic." In contrast with his finding, however, we remarked that Mr James T. Pyle, Deputy Administrator of the Federal Aviation Agency, had declared that he expected to see a supersonic transport aeroplane either in the air or approaching operational use by the end of this decade. He hoped that the USA would be first in producing a successful design, and he made it clear that the aircraft would cruise in the region of Mach 3. A leading article on the theme we titled "What Price Collaboration?" The same question must now be asked again with greater urgency.

Consider the picture: Britain is diligently, if frugally, pursuing her studies of a usable and economic transport for Mach 2 or thereabouts. A scale model, the H.P.115, is soon to fly as a research tool in a programme wherein it was hoped to win American collaboration. The Americans, on the other hand, seem determined to spurn such base degrees and are lurching forward into unknown, perhaps unattainable and seemingly unwanted realms.

Things may yet alter. Decisions—even when made in time of stress, fear and need—can be reversed. But for the present Britain is included out. This journal is in good company with Mr Adams, for we too believe that no one desires to see a once-proud industry crumble overnight, and that some kind of forced activity might serve to tide across some difficult times. But this support, as Mr Adams says, should be directed at potentially fruitful ideas. And the fruits of the Mach 3 airliner could be bitter ones indeed.

FROM ALL QUARTERS

Sir Harry for Avro

A CIVILIAN post, as managing director of A. V. Roe & Co Ltd, has been announced for Air Chief Marshal Sir Harry Broadhurst, GCB, KBE, DSO, DFC, AFC: he will take up the appointment following his retirement from the RAF on March 1, when he relinquishes the post of Commander Allied Air Forces Central Europe, in which he is succeeded by Air Chief Marshal The Earl of Bandon, GBE, CB, CVO, DSO (see Service Aviation, page 161).

As managing director of Avro, Sir Harry will be responsible for, among other things, Vulcan, Blue Steel and Avro 748 production. He succeeds Mr J. A. R. Kay, who was recently appointed sales director of Hawker Siddeley Aviation Ltd, the parent aircraft company. It is proposed that Sir Harry should also join the board of Hawker Siddeley Aviation Ltd. Commenting on the Avro appointment, Sir Roy Dobson, vice-chairman and managing director of the Hawker Siddeley Group, described Air Chief Marshal Broadhurst as "one of the great commanders of our generation," adding, "he will be a great asset to our organization."

Dowty's Boulton Paul Bid

DETAILS of a bid—described as "£2 million plus"—by the Dowty group for Boulton Paul Aircraft Ltd were disclosed last week. Dowty are offering 8s in cash and one of their 10s shares for every two Boulton Paul 5s ordinary shares, of which there are 2m. The bid, worth £2,137,750, values each Boulton Paul share at 21s 4½d; on the London Stock Exchange on January 26, when the news of the offer became known, they went up by a shilling to 18s then rose to 20s.

Directors of Boulton Paul have disclosed that profits before tax for the last financial year (to July 31, 1960) are expected to be around £350,000. They are recommending shareholders to accept the Dowty offer.

Fiat 7002 Flies

FOLLOWING more than a year of ground-running, the Fiat 7002 helicopter made a successful free flight of 30min duration at the company's Turin/Caselle airfield on January 26. The 7002 is a utility helicopter with two-blade rotor driven by cold tip-jets supplied by the Fiat 4700 compressor turbine. Both engine and airframe were designed and made by Fiat under contract to the Italian Defence Ministry and the Mutual Weapons Development Programme.

RB-47 and U-2

SIMULTANEOUSLY with President Kennedy's first Press conference, held on Wednesday of last week, the Russians released the two survivors of the USAF RB-47 which was shot down over the Barents Sea on July 1 last year while on a reconnaissance flight from Brize Norton. The President announced the release of the two officers concerned, Capts F. B. Olmstead and J. R. McKone; and later he referred to the flight over Russia on May 1 last year of the Lockheed U-2—whose pilot, Gary Powers, is serving a ten-year sentence in the Soviet Union—and said that he had directed that flights penetrating Soviet airspace should not be resumed.

Nuclear Propulsion

IN a main lecture to the Royal Aeronautical Society, being delivered before the Swindon Branch yesterday, February 2, Mr A. D. Baxter, MEng, MIMechE, FRAeS, executive director (engineering) of the de Havilland Engine Co, presented a most valuable assessment of nuclear power, with particular reference to aircraft and spacecraft propulsion. Starting with the first principles of gas turbines and nuclear reactors, Mr Baxter's paper leads into a discussion of the fundamentals affecting the design of aircraft nuclear turbojets, calculations being based chiefly upon M0.9 at 36,000ft or M2.2 at 50,000ft. The accompanying drawing shows a suggested closed-cycle installation in an aircraft designed for the latter case. The paper includes curves plotting thrust against Mach number for a closed-cycle engine at heights between sea level and 60,000ft, and also suggests an analysis of total propulsion-system weight.

Mr Baxter's conclusion is worth reproducing in full: "In the past few years, reactor developments have confirmed earlier views that nuclear-powered flight is technically feasible, and they have gone some way towards overcoming some of the earlier difficulties. The open-cycle turbojet and the closed-cycle gas-cooled reactor system both have possibilities of providing adequate power for sustained high-altitude supersonic flight, although only with large aircraft. When shielding is not a vital factor, as in unmanned rockets, the weights become much less. In both cases, the question of development in this country depends upon an assessment of our future role in world politics and technology. The precise benefits cannot be stated, but there should be sufficient advantages to justify a modest programme of research and development at this time. In conjunction with programmes on supersonic aircraft and high-temperature reactors it could provide a relatively inexpensive, but none the less valuable, vantage-point from which progress in any appropriate direction could be started."

RAF TO AVRO: Air Chief Marshal Sir Harry Broadhurst (left), appointed managing director, A. V. Roe & Co Ltd. He is being succeeded as Commander, AAFCE, by Air Chief Marshal the Earl of Bandon (right). See first news-story

Royal Aero Club Awards

ANNUAL awards of the Royal Aero Club for 1960 were announced last week. The list is as follows:—

Britannia Trophy: Mr T. W. Brooke-Smith, "for his work on the Short SC.1, culminating in his performance at the SBAC Display, when, for the first time, true vertical take-off was demonstrated, followed by transition to normal flight and, later, a vertical landing."

Geoffrey de Havilland Trophy: Mr V. H. Bellamy, "for flying a Spitfire 8 in the air races at Cardiff on June 4, 1960, at 254 m.p.h."

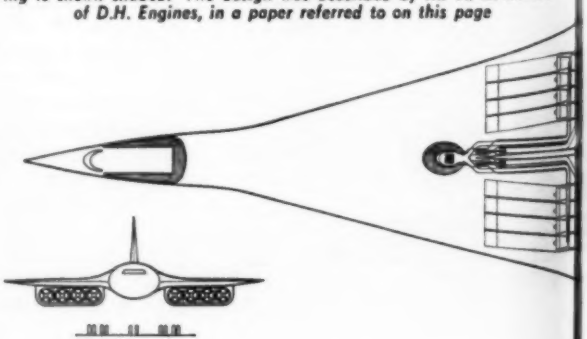
Bronze Medals: Mr B. F. Collins, for his work in building up Southend Airport and for his active interest in aviation over a number of years"; Mr J. M. Houlder, "for his services over the years to light aviation in the field of aerodrome operation, light-aircraft radio development and his demonstration of the all-weather possibilities of this type of aviation"; and Sgt J. Williamson, RAF, "for his achievements in British gliding and the continuous and unselfish work he has performed on the gliding instructional side."

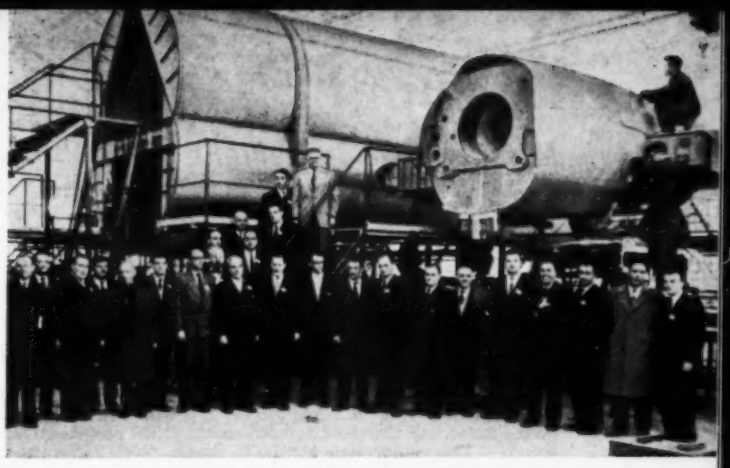
Louis Breguet Memorial Trophy: M Charles Marchetti, "for his work on the design and development of French helicopters, with particular reference to the Alouette."

William Geoffrey Cullen

WE record with regret the death on January 13 of Mr William Geoffrey Cullen, chief accessories engineer of the de Havilland Engine Co since 1948. An early colleague of Maj F. B. Halford, whom he joined on the design side in 1928, Mr Cullen became chief installation engineer of D.H. Engines in 1944. Born in 1896 and educated at Clifton and Cambridge, he joined the RFC in 1915; invalided out after an accident in 1915, he rejoined in 1917.

M2.2 AT 50,000ft is the design point for this hypothetical aircraft, powered by six turbojets fed by a closed-circuit nuclear reactor. Shielding is shown shaded. The design was described by Mr A. D. Baxter of D.H. Engines, in a paper referred to on this page





***ATLANTIC ALLIANCE:** NATO maritime-warfare specialists pictured during a recent visit to Breguet's Toulouse factory to inspect progress with the 1150 Atlantic. The second prototype, due to receive Rolls-Royce Tynes and D.H. Propellers, is seen in course of erection*

GEC Management Changes

THE board of the General Electric Co Ltd has announced the appointments of Mr T. B. O. Kerr as deputy managing director and Mr E. H. Davison as financial director. Mr Kerr has been on the company's board since 1952 and in 1959 was made director for finance and administration. Mr Davison is at present treasurer of Courtaulds Ltd, who have agreed to release him so that he can take up his new duties on March 1.

GEC have stated that "to strengthen the management, other appointments are being planned which will be announced in due course"; and they have announced the formation of a management committee, with the following membership: Mr Arnold Lindley, chairman of the company; and Messrs T. B. O. Kerr, E. H. Davison, O. W. Humphreys and R. N. Millar.

BEAGLE at Shoreham?

"A MAJOR new development project" for Shoreham Airport is under discussion. The chairman of the Joint Municipal Airport Committee, Mr. T. N. Barling, said last Monday that there had been meetings with the directors of F. G. Miles Ltd and with Mr Peter Masefield of BEAGLE. The airport "might be advantageously developed" if the design and manufacturing sides of BEAGLE were based there.

New "Flight" Appointment

A MEMBER of *Flight's* editorial staff since 1955, when he joined the journal from the de Havilland Aircraft Co. Ltd, Mr. J. M. Ramsden has been appointed Air Transport Editor. Mr. Ramsden was trained at the de Havilland Aeronautical Technical School, and is a graduate of the Royal Aeronautical Society, whose air transport course he has attended. For five years he has been primarily responsible for *Flight's* air transport coverage.

IN BRIEF

The Minister of Aviation, Mr Peter Thorneycroft, is to visit Belfast on February 16 and 17 for talks on the future of the aircraft industry there.

Short Bros & Harland Ltd are building more Canberra U.10 drones for operation by the Royal Navy from Malta. They will be based at Hal Far airfield and used as missile targets.

Air Cdre R. H. E. Emson, CB, CBE, AFC, is to be Commander, RAF, and Her Majesty's Air Attaché, British Defence Staffs, Washington, from March 1, with the acting rank of air vice-marshal. He was Director of Air Armament (Research and Development) at the MoS before taking last year's Imperial Defence College course.

A Cessna 180D owned by Southern Counties Aerial Contracts has been equipped by Airwork Services Ltd with a hopper capable of carrying 1,000lb of chemical dust. The aircraft is to be used for "oil sinking," the process developed in Germany for keeping beaches free from oil contamination.

Maj-Gen John H. Ives, at present Deputy Commander, US 3rd Air Force, has been named to succeed Gen E. Moore as Commander. Gen Moore is relinquishing his command (*Flight*, January 13) to take up the appointment of acting vice-commander, USAF Air Defense Command, Colorado Springs, from April 1.

The Council of the Institution of Mechanical Engineers have awarded the 1961 James Watt international medal to Prof Theodore von Kármán "in recognition of his important contributions to the advancement of mechanical engineering science, which have extended the frontiers of engineering knowledge, particularly in the field of aeronautics."

Applications for the 1961 John de Havilland Award—worth £400 and given annually to encourage initiative and adventure—should reach the Society of British Aircraft Constructors, 29 King Street, St James's, London SW1, by April 30. The 1959 winner, David Hyde, a research assistant at the College of Aeronautics, Cranfield, undertook an expedition through three continents, covering more than 28,000 miles. His experiences were described in two articles written for *Flight* and published in the August 19 and October 28 issues last year.

A Handley Page Victor B.2 is to be used by Rolls-Royce Ltd as a flying test-bed for Conway by-pass engines at their flight development establishment, Hucknall, Notts.

The French Navy are to order a second batch of 50 Dassault Etendard IVs with SNECMA Atar 8s. Fifteen of these aircraft will be IVPs, for reconnaissance duties, and the others IVMs, for intercepter operations from carriers.

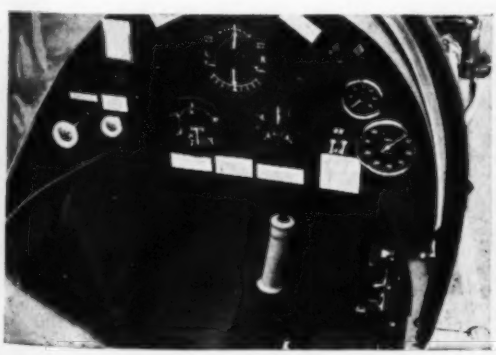
An award of £50 for original research into aerophilately, *The Aero Field* Anniversary Award, 1961, has been instituted by Francis J. Field Ltd, the philatelic dealers and publishers, of Sutton Coldfield, Warwicks. Copies of the rules are available from the company.

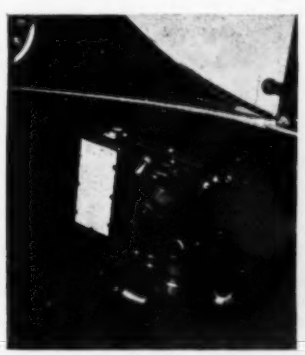
A booklet, *Research Careers in the Ministry of Aviation*, written for the information of final-year university students, has been published by the Ministry of Aviation, Strand, London WC2. At least 150 recruits to the Scientific Officer class will be needed by the MoA this year.

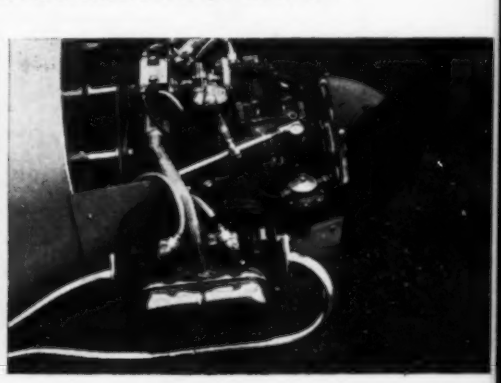
The Aslib Aeronautical Group are holding a meeting next Thursday (February 9) in the RAeS lecture theatre at 4 Hamilton Place, London W1, at 2.15 p.m., when a film on Black Knight, made by the RAE documentary film unit, will be shown. Subsequently Capt I. R. Maxwell, MC, chairman and managing director of Pergamon Press Ltd, is to give a paper on problems concerning the publication of scientific journals and books.

An Avro Vulcan B.2 of No 83 Sqn (the first unit to be equipped with this mark of Vulcan) was flown from RAF Scampton, Lincs, last weekend to Los Angeles, Cal, where it is being examined by the design and development staff of Douglas Aircraft Co. Tests are being carried out on the aircraft in connection with the Skybolt project. The Vulcan, captained by Sqn Ldr P. A. Ward, is later to visit Wright Air Development Center at Patterson AFB, Dayton, Ohio.

***SUPER TURBULENT:** The latest Turbulent built for the Tiger Club by Rollasons has an Ekco 1140 radio working off a 12-volt battery and sited as shown in the left-hand views. The power pack is behind the pilot in the locker, and the selector switch and headphone plug are on the right side of the cockpit. A generator will be fitted later. There are several other modifications, including brakes and electric and hand-operated starters. Right, installation of the Ardem flat-four powerplant*







Missiles and Spaceflight

LIQUID-OXYGEN PROBLEMS

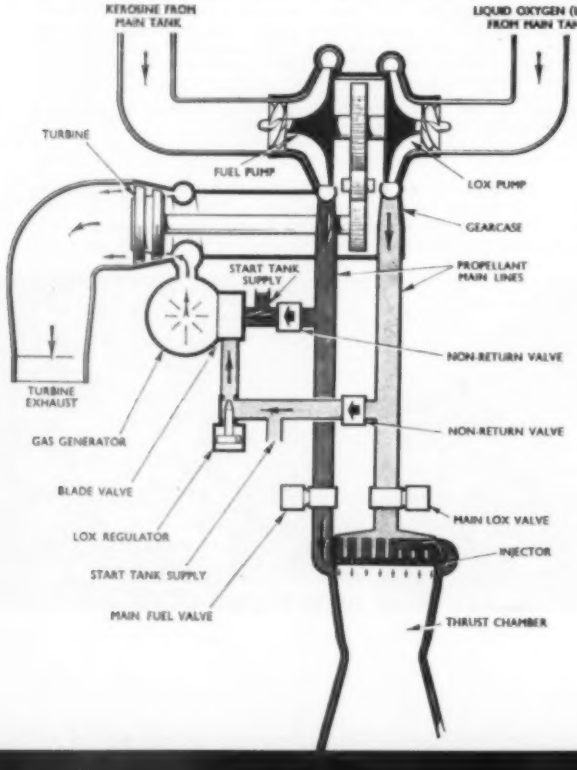
TIMELY, in view of the recent spillage of some 600gal of the fluid at an RAF Thor emplacement (reported last week), is this condensed presentation of a paper entitled *Problems with Liquid Oxygen in Large Rocket Engines*, which was read before the second Cranfield Symposium on rocket propulsion last month. The author was Mr I. E. Smith, chief performance engineer (rockets), Rolls-Royce Ltd, who is careful to point out that his paper deals only with the difficulties; the fact that liquid oxygen is employed in the largest rocket engines is, he said, recommendation in itself.

Mr Smith's paper highlights problems arising in the fluid's control and management. To do this [he said] it is proposed to follow the course of an engine test from the initial filling of the tanks to the final analysis of the data. Such an engine consists of a regeneratively cooled chamber fed by two centrifugal pumps mounted on a common shaft and driven by a turbine. Power for the turbine is derived from the combustion of a small proportion of the main propellant flows in a separate gas-generator, the power output from which is maintained constant by means of a regulator in the liquid-oxygen feed line. The engine is started by separate starting tanks which supply propellants to the gas-generator only.

Liquid oxygen is transported at its normal boiling temperature of 90°K, and in this state fed into the main tank on the test stand or vehicle. This can be done either by addition of heat to the supply tank or by means of a pump. Once the main tank has been filled further boiling is suppressed by slight pressurization, and the surface/volume ratio is usually such that the temperature rises by only a few tenths of a degree per minute. But the liquid in the line to the engine warms up much more rapidly, since the surface/volume ratio is much higher than in the tank itself. The liquid soon reaches its boiling point, and, in the absence of particles containing absorbed gas, undergoes superheating. When boiling finally takes place the bubbles expand very rapidly, extracting heat from the liquid until the system is once more in thermal equilibrium. At a superheat of only 1°C liquid oxygen will produce twice its own volume of vapour at pressures close to atmospheric, and the pressure surge as the gas escapes into the tank and the liquid falls back has been known to cause serious structural damage. The remedy adopted is to provide a continuous circulation of cold liquid, either from the tank or from a separate source. When the preparations for firing are complete, the tank is pressurized to about 2 or 3 ata, to prevent boiling during the test.

A Rolls-Royce RZ.2 rocket engine. This unit, half the propulsion system of Blue Streak, is that on which Rolls-Royce have cut their teeth in the big-rocket field

Schematic cross-section of the RZ.2, tints indicating the flows of liquid oxygen and kerosine. The design of this engine was based upon the early Rocketdyne unit designed for the Navaho III booster



When the main valves are opened and liquid oxygen enters the engine, vigorous boiling ensues until the metal surfaces have cooled to liquid-oxygen temperatures. Any attempt to start the engine at once would lead to violent and unpredictable transients, but the main passages can be precooled simply by allowing liquid oxygen to flow under tank head for a short while before starting. It is in the smaller lines, such as the gas-generator feed system, that the greatest difficulties are encountered; and this particular system controls the behaviour of the entire engine. Precooling of the lines up to the last point of control, the gas-generator valve, may be achieved by providing a bleed to some point of low pressure in order to allow a small flow to pass (care has to be taken in selecting the return point, in order not to bleed off too much during steady running). In the engine illustrated, in which the oxygen is supplied to the gas-generator by a constant-pressure regulator, a certain tolerance may be allowable, but for a constant-resistance control a bleed of uncertain magnitude may introduce more problems than it eliminates. In such cases the designer has no option but to close the bleed lines with a solenoid valve once they have served their purpose. Problems of this type apply to unprimed lines in general, although the difficulties are greatly increased by a propellant which can, so to speak, generate its own gas pocket.

Not only the surfaces in direct contact with the liquid oxygen are cooled during this phase, but also such others as valve spindles, control cylinders and shaft bearings. Stringent precautions must be taken to avoid the presence of condensible gases and vapours which would cause seizure. Nitrogen has a lower boiling point than liquid oxygen, and may safely be used for purging. However, water vapour must be avoided at all costs if the freezing of controls is to be prevented. In order to err on the safe side, heaters are generally fitted wherever freezing is liable to occur.

With a non-cryogenic propellant the starting pressure at the pump inlet is essentially tank head minus the head required to accelerate the fluid along the line. For liquid oxygen the corresponding pressure is at least an atmosphere less, owing to the vapour pressure of the liquid, and in practice the deficit is usually rather greater. Moreover, designers frequently place the liquid oxygen tank ahead of the fuel tank in order to minimize c.g. shift in flight, which means that the oxygen line becomes at least as long as the fuel tank, and the acceleration of the propellant in the pipe normally outweighs the gain in static head. As a result an initial 60lb/sq in absolute at the bottom of the tank may dwindle near to zero at the pump inlet, leading to severe cavitation at the pump and turbine overspeed.

The answer may be to minimize acceleration loss by employing as large an inlet line as practicable. Methods of ensuring that

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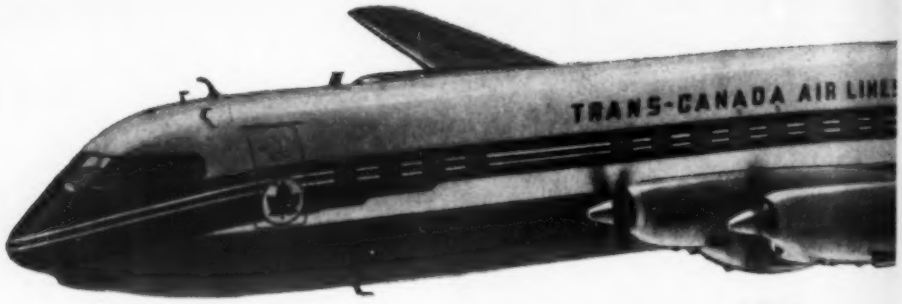

TCA VANGUARD fleet will land on Goodyear

Goodyear tyres, wheels, brakes and anti-skid equipment have been specified for T.C.A's fleet of Vickers Vanguard type 952.

GOODYEAR

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Missiles and Spaceflight . . .

the liquid oxygen is as cold as possible are usually worthwhile, and it has even been found profitable to cool some to the temperature of liquid nitrogen immediately before starting, yielding a gain in suction head of 12lb/sq in. From the engine side, the problem may be approached by reducing the pump acceleration; but there is a limit to this, since extended operation at a low thrust level may lead to combustion instabilities. Severity of cavitation is influenced by the specific and latent heats and the liquid/vapour density ratio of the liquid being pumped. A high latent heat is favourable, in that the production of a small mass of vapour results in a considerable cooling of the remaining liquid. Likewise a low ratio of the liquid/vapour densities tends to be beneficial, and on this count liquid oxygen provides a better cavitation performance than many other propellants.

Cut-off problems are in many respects similar to those experienced on starting. Just as it was found necessary to bleed dead ends and enclose spaces in order to achieve proper priming, it is equally important to allow the vapour generated from trapped liquid oxygen to escape, and it frequently happens that the same bleed lines or points can serve as vents. The main source of trouble at cut-off comes from the liquid oxygen trapped between the propellant valves and injectors, for as the chamber pressure falls below the s.v.p. it immediately evaporates. In the case of the gas-generator the resultant high mixture ratio can damage the turbine blades or guide vanes, and in the main chamber it results in an unpredictable increase in total impulse. Arrangements may be made for the oxygen to be shut off before the fuel, and for the injector cavities to be purged with an inert gas; but both measures result in a further increase in complexity.

Having successfully completed a test or flight the next step is to examine the instrumentation records. Steady-state evaluation is theoretically relatively uncomplicated, involving measurement of the propellant flows, and the magnitude and direction of thrust. Transient behaviour is much less straightforward. The importance of such behaviour cannot be over-emphasized, since the rate at which thrust builds up and dies away affects the magnitude of the dynamic stresses in the vehicle. Furthermore, incorrect mixture-ratio conditions, though persisting for only a short time, can have a dramatic effect on turbine or chamber life.

By far the most revealing measurement is that of pressure, either absolute or relative to some other part of the system, and in examining such records in liquid-oxygen lines one receives a rude shock. A glance may indicate that the pump inlet experienced a pressure surge several times the steady running value, and certainly in excess of that which the inlet lines were stressed to withstand. Similarly, a calculation of mixture ratio from the difference between oxygen injection pressure and chamber pressure suggests impossibly high starting values. In contrast, pressures appear strikingly steady once steady-state operation has been achieved, and at cut-off the transducers record a consistent decrease in pressure with no alarming symptoms. The reason for this anomalous behaviour lies in the way the transducers are installed. Since many are unsuitable at liquid-oxygen temperatures, it is common practice to interpose a length of connecting line to insulate them from the effects of low temperature by a column of gas.

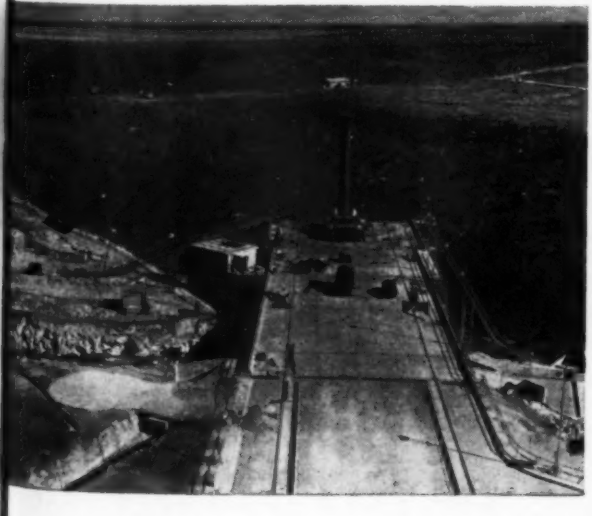
During the engine start, the increase in pressure forces the liquid along the transducer line, compressing the gas ahead of it, until the pressure in the transducer is equal to that in the main system. But the momentum of the column of liquid further raises the pressure within the transducer until this momentum is destroyed. The process then reverses itself, and the record takes the form of a damped oscillation. The liquid oxygen within the line gradually evaporates, and at cut-off a more faithful record is obtained as the low-density gas escapes from the transducer line. This inherent ambiguity can be overcome only by the rather costly flush transducer with a heated sensing element. Accordingly, accurate diagnosis of starting transients is difficult, and evidence of abnormal oxygen flow often has to be obtained either from its effect on other parameters, or, in the worst cases, components.

EUROPE'S BIG DECISION

By the time this issue appears the decision whether or not Europe will have its own space-launcher programme—and, if so, whether Blue Streak will be used—will probably have been taken. To reach such a decision is the only main purpose of the twelve-nation conference in Strasbourg, convened jointly by the British and French Governments, which began last Monday (January 30) and was expected to last four or five days.

The Minister of Aviation, Mr Thorneycroft, rounded off his European travels in preparation for the conference with a visit to Stockholm on January 26-27. In Strasbourg on the eve of the conference he denied French press reports that the motive of the British plan was to recoup losses on the Blue Streak missile programme. "In fact," he said, "we are making Blue Streak a gift to our European friends. As far as Britain is concerned we are writing it off. It is a gift . . . free."

These are the first photographs to be released showing the only Blue Streak launch emplacement completed at Woomera. Almost identical to the C-3 installation at Spadeadam ("Flight," September 16, 1960), the launcher is mounted at the end of a causeway on which runs a huge servicing tower, seen enclosing the launcher in the right-hand photograph



COMMUNICATIONS SATELLITES IN EUROPE

The Federal German Post Office is to send a group of telecommunications specialists to Britain to discuss British plans for a communications satellite. This announcement on January 27 followed talks in Bonn between Mr Reginald Bevins, Postmaster General, and the Federal Minister of Posts, Herr Richard Stücklen. It was stated that these talks had been arranged before the visit to Germany of the Minister of Aviation earlier last month.

This photograph of a weightlessness experiment in an Il-14 aircraft, including cameramen endeavouring to record the experiment under difficulties, is from the prizewinning Czech film "Passport to Space" directed by Kurt Goldberger. Our attribution of this film to the Soviet Union in our issue of September 2, 1960, was incorrect

Missiles and Spaceflight . . .

CHIMPANZEE FLIGHT DUE

The ballistic flight of the Redstone-launched Mercury MR-2 capsule carrying a chimpanzee was forecast "in a week or so" in a National Aeronautics and Space Administration announcement on January 28. This flight, with a planned maximum altitude of 115 miles and a downrange distance of 290 miles, was to include the first test of the Mercury life-support system, and the first exercise of the new Mercury Control Center at Cape Canaveral during a biological flight.

WORKING TOGETHER

Results of civil/military co-ordination in US space planning were announced last month by the National Aeronautics and Space Administration and the Department of Defense. Some of the actions initiated by the Aeronautics and Astronautics Co-ordination Board, set up last September, were listed as:

Responsibility for development and procurement of each major launch vehicle will be undertaken by a single agency only. Thus the Air Force has full responsibility for the procurement of the Agena B, and NASA for Centaur, regardless of whether the vehicles are used for military or civilian programmes.

Assumption by NASA of the task of disseminating unclassified orbital information on satellites, following the transfer of operational control of the USAF Spacetrack facilities and the Navy's Spasur (space surveillance) satellite detection net to North American Defense Command.

Decision to launch initial Centaur development vehicles at an azimuth angle appropriate to NASA's existing tracking stations. On completion of the ground network for the Defense Department's Project Advent communications satellite, and perhaps as early as the fourth Centaur launch, the angle will be changed to correspond to the Advent network.

Joint USAF/NASA planning, funding and construction or modification of existing launch pads at Cape Canaveral to provide pads for Atlas-boosted space vehicles.

DIG THAT MOON

Hughes Aircraft Co has been selected by the US National Aeronautics and Space Administration for contract negotiations to build the Surveyor lunar spacecraft. The craft will be designed to make a soft landing on the Moon, perform chemical analyses of the lunar surface, and relay back to Earth television pictures of lunar features. The Jet Propulsion Laboratory of California Institute of Technology will provide technical direction for the programme, under which seven Surveyor craft will be launched between 1963 and 1966.

Surveyor will weigh approximately 2,500lb when injected into a lunar trajectory by its Atlas-Centaur launch vehicle. The weight of the craft on landing will be 750lb, of which 500lb will be structure, communications equipment and temperature control instrumentation. The 250lb of scientific instrumentation will include several television cameras, a sensitive seismometer, a magnetometer, instruments to measure lunar gravity, a drill, instruments to analyse the composition of the Moon's surface and subsurface, and instrumentation to measure radiation and the lunar atmosphere.

Height of the Surveyor, ready for operation on its landing tripod, will be about 11ft. The drill will be lowered from the craft and will penetrate the Moon's surface to a depth of at least 18in. Small fragments of the surface and subsurface will be raised into the spacecraft where instruments will carry out chemical analyses. One of the television cameras will be used to view this operation so that scientists at the JPL tracking station at Goldstone, California, can monitor the performance of the semi-automatic system.

Surveyor is a follow-on programme to NASA's Ranger series of spacecraft, which are scheduled to hard-land small instrument packages on the Moon in the next few years. Surveyor programme manager at JPL is Mr Walker E. Giberson, working under the Laboratory's lunar programme director, Mr Clifford I. Cummings.

COMMONWEALTH SYMPOSIUM RECORDED

Under the misleading title *Spaceflight Technology*, the proceedings of the first Commonwealth spaceflight symposium organized by the British Interplanetary Society in London during August 1959 have been published by Academic Press Inc (17 Old Queen Street, London SW1) at £3 15s. The book contains the 18 papers presented at the meeting—but not the discussions on them—under the main headings of programmes and economics, launching vehicles, aerospace vehicles and re-entry, propulsion systems, space vehicle cabins, instrumentation, tracking and communication, navigation and exploration of the Moon.

The papers include *Britain's Place in Interplanetary Exploration* by J. E. Allen; *General Review of a British Spaceflight Programme Based on Blue Streak* by G. K. C. Pardoe; and *The Jodrell Bank Radio Telescope as a Space Communicator* by J. H. Thomson.

The US Air Force at Cape Canaveral charges the US Navy $5 million for the use of Missile Test Range equipment and personnel during each Transit satellite launch.

A six-months study of the use of Earth orbits for launching manned expeditions into lunar and interplanetary space will be made by Douglas Aircraft Company for NASA's Marshall Space Flight Center, Huntsville.

Slomar (Space logistics maintenance and rescue) is the designation of a current logistics study being carried out by Lockheed's Missiles and Space Division. The programme includes problems of navigation and radar systems, vehicle homing and lock-on systems, maintenance techniques, solar radiation and the escape of men from spacecraft.

A life sciences research laboratory was established at the US National Aeronautics and Space Administration's Ames Research Center, Moffett Field, California, on February 1. First section of the new facility to be formed is the Environmental Biology Branch under Dr Richard S. Young. Eventually there will be three Divisions, devoted respectively to flight medicine and biology, space medical and behavioural sciences, and space biology.

In preparation for system and static testing of the Saturn S-4 and future space vehicles, the first phase of a $2m modification programme is under way at the Douglas field station at Sacramento. The S-4 will form the second stage of the Saturn C-1 vehicle. At Sacramento a liquid hydrogen storage and transfer system will be installed and two Thor test stands will be altered and enlarged for S-4 cold-flow testing and static firings.

Discoverer 19 was reported by the US Air Force to have descended into the dense layers of the Earth's atmosphere and to have burned up on January 22, on either its 524th or 525th revolution. Launched by Thor Agena B on December 20, 1960, the satellite had as objectives the systems evaluation of the Agena B satellite and the collection of data on atmospheric phenomena and infra-red radiation in the Earth's atmosphere in support of programmes such as Midas. It had ceased transmitting on December 25.

The inventor of the satellite Doppler navigation system which formed the basis for the US Navy's Project Transit, Dr Frank T. McClure, has been awarded $3,000 by the US National Aeronautics and Space Administration for a contribution "of significant value in the conduct of aeronautical and space activities." Dr McClure is chairman of the research centre at the Johns Hopkins University Applied Physics Laboratory at Silver Spring, Maryland, and this was the first award made under the invention award authority of the US Space Act of 1958.

The use of a nuclear rocket powered by curium in the upper stages of vehicles employed for the first manned landings on the Moon is being considered by NASA. In the accurate study and analysis of the lunar surface it is important that no contamination arises from radioactive materials, brought from Earth, which might be the same as some of those already on the Moon. Curium does not occur naturally and would therefore seem to be an ideal power source for this application, since it would cause no conflict with materials already on the Moon and could be separated during analysis.

A major contribution to the US space effort during 1960 was made by the Douglas Thor booster, which provided first-stage propulsion for 14 of the 16 satellites and probes successfully launched. During the year a total of 26 Thors were fired, including five training launches from Vandenberg AFB by RAF crews. Twenty-one of the 26 were successful. The total number of Thors fired up to the end of 1960 was 108, of which 49 were research and development firings, 43 space launches and 16 training shots. Thirty-four of the 43 space firings were successful, 27 of them being scientific space projects and seven re-entry tests of experimental nosecones.

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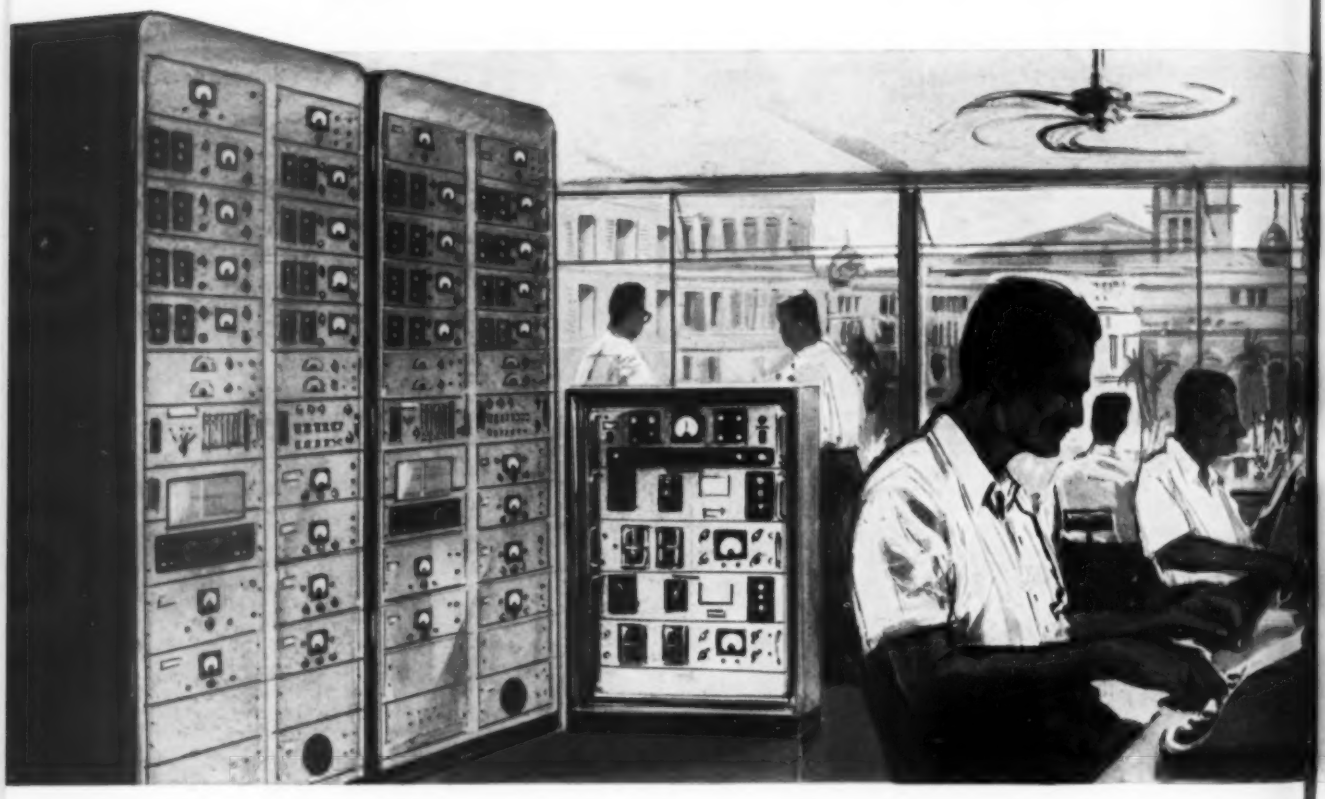

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America and the Supersonic Airliner

"INCLUDE ME OUT," SAYS DON ADAMS (New York)

AS had been expected for some months, the US Government recently indicated its willingness to subsidize the development of a Mach 3 commercial transport (*Flight*, December 16, page 960). Five million dollars have been earmarked for such a programme in the Fiscal 1961 budget, and it has been recommended that sums of eighteen and thirty-two million dollars be set aside for the project in the following two years. Many and varied reasons have been cited for proceeding with such a venture; but it is believed that there are just one or two key reasons behind the decision.

A very major consideration in the eyes of all politicians in America—if not indeed the world over—is the necessity for assuring that their constituents in particular and the country in general enjoy a healthy state of employment. For the past several years the American aircraft industry has been undergoing a gradual transition. Emphasis has been shifting from manned aeroplanes to unmanned missile and space projects. With this reorientation has come a widening degree of technological unemployment. No longer is there a need for vast numbers of workers with the traditional aircraft skills. Fabrication of aluminium sheet structures has given way in priority to the assembly of tiny, intricate electronic components. More dollars are being spent in the aircraft business in current times than in former years, but the total weight of deliverable hardware has been considerably reduced. More money than ever before is being spent on development work and on "support equipment," but few dollars actually see their way into aeroplanes pure and simple.

So, year by year, there is decline in the number of men required to build aircraft structures. And the future holds little promise of any rapid reversal of this trend. Faced with the prospect of having to lay off numerous workers, the aircraft industry has vigorously pursued lines of business which show hope of requiring the skills of the "metal benders." Hence we see companies investigating trailer caravans, the boat business, and many other fields in which light-alloy structures find a place. But through all this there is an understandable desire to stay in the aeroplane business. Those companies removing the words "aircraft" from their names (in favour of some more general term) do so not because of any real prophetic business sense, but because they simply do not have the abilities to withstand the ever-sharpening competition in the modern aircraft construction field. The pursuit of new military aeroplane projects accordingly becomes keener and harder fought. The Congressmen who would assure high employment for their districts are brought into play. The trade unions are called upon to apply pressure at high levels to keep the production lines rolling.

Paper Projects in Plenty

A distracting point is that each year there are fewer requirements for new aircraft. Times between requests for the development of some new type become increasingly longer. Accept this situation, and perhaps see an eventual locking of the doors? Or assume the offensive? Most manufacturers have faced these alternatives, and have resisted the harsh facts of life by creating a multiplicity of possible aircraft designs. There are new "paper" aircraft for every imaginable purpose. And where there is no genuine requirement an artificial need is created, simply so that the factories can be kept in a healthy state of employment. Although the B-70 bomber was not originally conceived in such a light, there are many who contend that the programme is being pursued mainly on grounds other than an absolute military need. It has been called a "make-work" project. Even the US Air Force is sensitive on this point, since many of their pronouncements deal with the "fringe" benefits of the Valkyrie project.

More pertinently to the subject under discussion, it would appear that the supersonic-airliner programme is being initiated on exactly the afore-mentioned premise. The giants of the American aircraft industry would like to build a supersonic transport. The project would keep a lot of people on the payrolls even if the aircraft never saw airline service. But the airlines cannot afford to support the supersonic programme, and sufficient civil orders would not be forthcoming to make the project a profitable venture for some manufacturers. Why? Because currently conceived supersonic transports are clearly and grossly uneconomic. Not enough could be sold to pay off write-off costs. The airlines would not purchase them, because at today's fares the aircraft could not earn a profit.

Hence the movement to get the Government to underwrite the project. It would seem that they have taken the bait and decided to support the supersonic programme.

Keeping Ahead of Mr K

It is all very well for a relatively small group of people to decide that a Government project should be undertaken; but it is another thing to secure public approval for the proposed move. Despite great Air Force propaganda, a long period of time elapsed before the nation lent its support to the B-70 programme. The gimmick being used to boost the supersonic transport is prestige. Unless America is first with a faster-than-sound airliner, it is being argued, she will lose her once pre-eminent place in the aircraft world. Losing the supersonic race to the Russians would, it is claimed, be a further sign of her lag in the scientific race.

One finds it hard to sustain this contention. Whether it is generally recognized or not, the measure of progress in the modern world *has* been transferred from aircraft to missile/space activities. The country which wins the space race will gain most of the prestige. A second-place space effort simply cannot be overcome by some contribution in the aircraft field, however outstanding and significant that effort may be. An example of this postulation was evident when, recently, Convair had to take a full page in the *New York Times* to advertise the fact that their B-58 had broken no fewer than six officially certified aircraft world records. Some of these records had been held by Russian products. Not long ago such an event would have been editorial front-page news and a cause for national rejoicing. In America today, several bits of spaceflight news make the front page almost daily while aeroplane news (except for ghoulish crash reports) is usually conspicuous by its absence.

In the writer's opinion, building a supersonic transport will stimulate nothing more than self-created *and false* prestige. The Mach 3 programme should not now be implemented unless it can be conclusively proved to be an economically worthwhile venture. The US simply should not engage in supporting a technological WPA* project.

Obviously, no one desires to see a once-proud industry crumble overnight—or ever. Some kind of forced activity could well serve to tide the manufacturers over what will prove to be some difficult times, provided that this support can be directed at potentially fruitful ideas. What comes to mind is an effort to

* *Works Progress Administration, from the famous "depression."—Ed.*

The USAF/North American B-70 Valkyrie, says the writer of this article, "has been called a 'make-work' project." But such allegations do it an injustice: not only is it the focal point for "state-of-the-art" advances in every aspect of aeroplane design—an essential pre-requisite to a 2,000 m.p.h. airliner—but it could even see squadron service with Strategic Air Command

America and the Supersonic Airliner . . .

develop aircraft intended for low-cost operation rather than for maximum cruise speed—an almost untapped market. Even today's transatlantic economy fares cannot be said to come within the definition of "low cost." A fare of, say, $150 for a round-trip transatlantic excursion would multiply current traffic severalfold. Of course, such fares are not realizable with today's aircraft, nor will they be feasible if the present line of design is pursued. What is needed are airliners designed exclusively for optimum economy. The Vickers Vanguard philosophy should be universally adopted.

Instead of expending its funds on a supersonic type, the US Government might well put them to better use by supporting the development of a really-low-cost vehicle. Economical cargo transports should also be encouraged; as silly as the supersonic proposals are the suggestions for cargo derivatives of the big jets. It is hard to imagine that a stretched 707 could carry cargo at anywhere near the fares of an aircraft optimized for low cost.

In short, if we are to begin an aircraft project tomorrow simply to help the industry through some bad times, there are certainly more worthwhile projects than the supersonic airliner. All that would be needed for the industry to begin work on such projects —perhaps even using their own or borrowed capital—would be for the Government to announce that on some day in the future the fares on a particular route were to be reduced by some substantial amount. To prevent chaos, the number of flights initially approved at low rates would be limited to a small number, but would be increased by a fixed margin each year. Several airlines could be granted certificates for these routes, and if carriers already operating over them were not receptive to the plan, new airlines could be brought in.

If this or some better plan were adopted the airlines would seek out the manufacturers who could supply them with the most inexpensive aircraft. A market for the proposed low-cost aircraft would be stimulated. Would such an innovation reduce traffic at customary fares on existing aircraft? The answer is assuredly NO. Speaking from personal experience, I have made over 300 commercial flights, *every one* of which was for business purposes; but I have on several occasions driven an automobile upwards of 1,500 miles on a one-week vacation. *Air fares are simply too expensive, and all the supersonic airliners in the world, all the fancy magazine advertisements, promises of exquisite cuisine and so forth, will not change that simple fact.* All of middle-class America and a good part of the whole world is in a similar position. Sooner or later the airline industry will appreciate the significance of this simple statement. Then and only then will the aviation industry achieve full maturity.

* * *

None of the above remarks imply any disbelief in the *ultimate* development of a supersonic type. As certain as my conviction which supports the fundamental concept of low-cost transport, is an equally strong feeling for future increases in aircraft speed. Every minute spent on the previously noted 300 business flights was a waste of my own and the company's time. Both of us wished that travel time could be reduced to zero. If faster transport were available, even at some premium rate, it would have been useful. It will be more useful in the future. But the supersonic market is presently small. The significance here is that business and pleasure travel are vastly different. In one there is an urge to use faster and faster transport; in the other there is a *necessity* for economy.

Perhaps Government support for a supersonic programme should be directed at developing an economical supersonic engine. The right engine will be needed in the not too distant future, and the industry has always shown that, given the right engine, it can develop superb aircraft.

LIFE OF AIRLINE HELICOPTERS

MECHANICAL defects have contributed to about one-quarter of the accidents occurring in scheduled helicopter operations, and of the 791 incidents examined, 22 per cent could be attributed to mechanical deficiencies. Accidents due to engine failure have been "extremely high," owing to the almost exclusive use of single-engined types and to the high engine-failure rate of the helicopter as compared with the fixed-wing aircraft. This was stated by Mr H. E. Le Sueur, a senior surveyor of the Air Registration Board, in the paper he presented recently to the RAeS Rotorcraft Section.

Perhaps the most interesting part of the paper is that concerning fatigue, in which context the author suggests the establishment of safety factors which—as he confesses—"may cause some consternation with those who are concerned with the establishment of safe-lives."

In an example, he estimates the reliable safe life of a part whose *apparent* safe life is established as 10,000hr according to the generally accepted method of factoring the S-n curve by 1.2, assuming "damaging cycles" of ten per hour. Using the method he outlines in an appendix to the paper, a safe life works out at not 10,000hr but 4,200hr. Again, he examines the safe life of a helicopter with a rotor r.p.m. of 250 which has an *apparent* safe life of 10,000hr, this being based on the stress measured at normal operating speed for 80 per cent of the component's life. Using the author's method the reliable safe life works out at a mere 40hr.

This, he admits, is "ridiculously low." But he concludes that for all normal level flying with vibration frequency of rotor order it is necessary to design for infinite life with a safety factor of 3.0 for light alloys.

Appendix 2 in Mr Le Sueur's paper is an important contribution to the subject of helicopter fatigue, and obviously this brief summary is taken out of context. The full paper will appear in due course in the Royal Aeronautical Society *Journal*.

EAR-TAGGING MOOSE BY HELICOPTER

A NEW use for helicopters, that of ear-tagging moose to check on the animals' whereabouts and numbers, has been discovered in Canada. The method, evolved by Officers D. W. Simkin and E. H. Stone of Ontario's Department of Lands and Forests, is for the helicopter (a Bell 47 variant on floats) to land behind the moose on a lake. The aircraft, piloted by Ben Kent, taxies up behind the animal as it swims until the pontoons are against its head. The forestry officers then fix an ear-tag with pliers, an operation taking only three minutes.

Previously, checks on the moose (Canada's finest game animal) had to be carried out by corraling them or rounding-up by cowboys, both lengthy and often hazardous operations. The helicopter method has been found to be much quicker and more humane. In its initial trials good results were achieved, 73 moose being observed in 11hr flying time and 50 of them tagged (ten calves, 11 yearlings, 20 adult cows and nine large bulls). The bulls, it is reported, gave no more trouble in "finding and fixing" than did the antlerless moose.

As to the continuance of this method of checking on moose, a Canadian correspondent reports: "Ontario's Fish and Wildlife Branch now feels assured by this new helicopter use that much unknown data can be obtained even in the next three years, giving far more rapid answers than formerly to many still unknown factors in the life of this magnificent wild animal."

PRIDE OF UNICORNS

IT was inevitable that, sooner or later, someone should write the story of the Atcherley brothers: Dick, the brilliant pre-war RAF aerobatic pilot, member of the Schneider Trophy team, King's Cup winner, first post-war Commandant at Cranwell, C-in-C of the newly formed Royal Pakistan Air Force, finally AOC-in-C Flying Training Command as Air Marshal Sir Richard Atcherley; David (a later starter in the RAF, joining from the Army when Dick was already famous) CO of a night fighter squadron and then a wing during the Second World War, Chief of Staff to Basil Embry as AOC 2 Group, finally AOC 205 Group and an air vice-marshal at the time of his tragic disappearance on a flight from Fayid to Cyprus in 1952. Had he lived, David might well also have become an air marshal and a knight, so closely did the brothers' careers run in parallel; though their story, as told by John Pudney in *A Pride of Unicorns* (Oldbourne Book Co Ltd, 121 Fleet Street, London EC4; illustrated; 21s) makes it clear that the Atcherleys achieved what they did through brilliant non-conformity. In the J. B. Priestley symbolism (from which Pudney's title is taken) of two elements in the British national character, they were "unicorns"—men of ideas, continually prodding at the establishment, whose respectable members are the "lions."

But Pudney rightly stresses how much the non-conformist Atcherleys contributed to the spirit of the RAF, especially when it was a new Service and "needed its own myth and legend as well as discipline and a tradition." In that sense, they were in the right place at the right time, Dick making his name in the heyday of aerobatic flying and world speed record contests, David (and Dick) contributing their own unorthodox brands of courage and enterprise to Second World War operations. What they would have made of the missile-age RAF, had they started their careers in the 1950s, is matter for conjecture. What they contributed to the spirit of the young Royal Air Force, and to its triumphant emergence as a fighting arm, is matter for history—and gratitude.

H. W.

EXPORTS:

1960 Results and a View of the Future

Mr E. C. Bowyer, CBE, director and chief executive of the SBAC

DURING 1960, exports by the British aircraft industry amounted to £142.3m. This total was made up of £73.7m for engine sales—a record figure—and £61.7m for the sale of aircraft. It was the third highest overseas sales total ever recorded by the industry (1959's figure of £156m is still the record) and represented 4.02 per cent of the total United Kingdom exports of produce and manufactured goods.

In a recent comment on last year's figure the Society of British Aircraft Constructors' chief executive and director, Mr Edward Bowyer, said that it was gratifying to see that the 1960 result came so near to the 1959 record. He added: "For five consecutive years, from 1955 to 1959 inclusive, the industry achieved new records; but more than two years ago I saw fit to utter a warning that a dip in our export trade was to be expected in a year or so. It was clear at that time that the home demand for military aircraft had been curtailed and that the world's airlines had over-bought. I added, however, that given real success in selling and the measure of Government support which all informed opinion in the industry —and a good many people outside it—believed to be necessary, that dip need not be prolonged." Referring to the future, Mr Bowyer continued:—

"Whilst I cannot, on the evidence, forecast a spectacular rise in our export trade in 1961, it is gratifying to note that the value of orders in hand for overseas customers last year exceeded comfortably those held in 1959. Deliveries will, therefore, be brisk during the next twelve months and this will be reflected in our export figures.

"The next few years will see a keen battle for business in the aviation markets of the world, and already sales teams from the new airframe and aero-engine manufacturing groups of the industry are active. Given essential Government backing in such matters as competitive export credits, the efforts of our salesmen will, I am confident, meet with success."

The "orders in hand" to which Mr Bowyer referred include some £30m worth for 35 airliners ordered during last year by operators in Canada, the United States, Egypt, Greece, Austria, Ghana, Japan, Germany and the Lebanon. Another valuable piece of business, from the US, was the £3,300,000 order from United Air Lines for Rolls-Royce Avons for the company's 20 Caravelles.

SBAC add the comment that "meanwhile, as the director emphasized, sales teams are active abroad. The claims of such aircraft as the Comet, Trident, VC10, BAC.107, Argosy, Avro 748, Westland helicopters, and others, are being strongly pressed; while existing and new aero-engines—notably those manufactured by Bristol Siddeley and Rolls-Royce—will assuredly be fitted to aircraft in many countries during the 1960s."

Exports for December last year came to £13,229,396. This figure was made up as follows: aircraft and parts, £6,183,767; engines, £6,394,594; electrical equipment, £357,439; instruments, £188,790; tyres, £104,806. The leading buyers of aircraft and parts were Canada (£1,967,927) and the Lebanon (£1,231,979), chief engine buyers the US (£1,607,760) and Canada (£1,190,849).

A comparative breakdown of exports for the whole year (£142,323,594) is as follows: aircraft and parts, £61,754,641; engines (a record figure), £73,687,055; electrical equipment, £3,448,983; instruments, £2,517,768; tyres, £915,147. 1960's leading overseas buyer of aircraft was India, spending £8,567,113; next in order came the United States (£5,737,454), Argentina (£5,292,085), Canada (£3,958,060), Switzerland (£3,786,961) and Egypt (£3,198,415). The year's leading engine customers were as follows: the United States (£16,686,571), Canada (£10,200,801), France (£10,144,879), India (£5,259,207), Italy (£4,588,789) and West Germany (£3,517,035).

Sales of aircraft and engines to dollar countries, amounting to £36.5m, ran at a high level last year. The aircraft mainly responsible for this success were Viscounts, Vanguards and Argosies; while Conways, Darts, Tynes and Elands made up the bulk of the dollar trade in engines.

WIDGEON'S GHOST

This striking impression of one of British United Airways' Westland Widgeons hovering over Battersea Heliport was the result of an intentional but not quite perfectly timed double exposure—one shot to photograph the aircraft and the other to get the GEC platform lighting and the background scene

Sport and Business

PIPER COLT in the Air

BY MARK LAMBERT

No 139 of the Series

THOUGH the Piper Colt was first announced as recently as last November the first demonstrator is already in this country with its American C of A validated and its public-transport category C of A virtually complete. About a dozen Colts were ordered even before the machine arrived and prospects for many more sales look rosy—principally because the standard version costs only £2,795 fly-away Kidlington, which is several hundred pounds cheaper than its nearest rival.

The standard Colt has dual control, heater, ventilators, generator, battery, starter, Sensenich fixed-pitch, metal propeller and 15gal fuel tank, but only basic instruments and no ignition screening. The Custom model, costing £2,995 in Britain, also has ignition screening, night lighting, turn-and-slip indicator, cigarette lighter and an arm-rest on the left wall. The Super Custom, at £3,281, has full blind-flying instruments, landing and taxi lights, eight-day clock and o.a.t. gauge. Piper Auto-Control autopilot and radio may be fitted to the two custom models; and spats, a second 15gal fuel tank and strut fairings and tie-down rings may be added to any of the three models. The load-carrying ability of the Colt is exceptional. For example, the Super Custom can carry two people, 30gal of fuel for six hours' endurance, 72lb of baggage and 17lb of radio. The one I flew had only a single 15gal fuel tank, but everything else except autopilot and radio.

To justify the Colt, and other aircraft like it, for training and basic flying, one must state what to the hardened sheepskin and tailskid types may sound like a heresy. There is absolutely no reason why flying training should be in the least uncomfortable—nor why the learner should have to handle an aircraft that is in any unnecessary way difficult to manage. No modern aeroplane will get away with a rough stall, or without adequate stall warning. A pupil should learn to know the stall, and to recover from a spin; but, once trained, he should not be expected to live permanently in the shadow of these incubi. Nowadays, men who have the money to fly need and expect comfort. They want to do something with an aeroplane—to visit places with their families or keep business appointmnets; to enjoy daring exploits with the wind in their faces is *vieux jeu*. America's so-called trainers fulfil these modern requirements adequately and they often also perform the very important function of inducing the learner to buy for himself a bigger aircraft from the same manufacturer.

The Colt is therefore both an ambassador for flying and an appetizer for Piper aircraft. Also, it is using fully amortized Tri-Pacer jigs and tools and much of the stocks of parts still on hand now that production of this ubiquitous little aircraft is coming to an end. All this has been pointed out by Mr William T. Piper, whose personal idea the Colt was.

So here we have an efficient, capable two-seater with all mod. con. and the ability to carry autopilot and airline radio—as well as night lighting, full panel, cabin heater and ventilator, ashtray and car-type interior trim. That little Lycoming 108 h.p. engine and metal fixed-pitch Sensenich propeller really give it some useful urge, with an initial climb, at light load, of well over 1,000ft/min, and a sea-level cruising speed of 108 m.p.h. at 6gal/hr. It is cleared for spinning, but I found it to be quite strongly stall-resistant.

Piper have spared no effort to keep the price down, but the Colt does not look or feel cheap. External appearance is similar to that of the Tri-Pacer, but the hump for the rear seats is gone and the wing-span is slightly shorter. There are no flaps. Access is through the single door on the right, and everything can be easily located. Switches and plungers are distributed along the bottom of the main panel, beneath the push-pull control wheels. The on/off fuel cock is on the left wall. The central brake-lever and parking catch of the Tri-Pacer are retained, but the key-operated "1, 2, BOTH" ignition switch now has a fourth position for starting, just as in modern cars. Fuel gauge and ammeter are on the right of the panel, and a Piper trim-crank in the roof adjusts tailplane incidence. Behind the seats is an enormous cavern for luggage or freight, but no separate baggage door. The seats are individually adjustable.

I flew the Colt in marginal weather—about 2,500yd visibility in haze, an indistinct ceiling, and the ground just visible from about 900ft. There was a light wind at right-angles to the grass runway and ground-level temperature was exactly 0°C—very unpleasant to stand about in. So I climbed in as soon as possible, primed and started the engine and pulled the cabin heat control fully on. Even before the engine had warmed up, the cabin was at an agreeable temperature and demisting air was keeping the windscreen clear. The seating position was comfortable and visibility over the sloping nose good. The wing-roots protrude well forward like blinkers and the side windows are fairly shallow, so visibility for an all-round look-out or for poor-weather circuits is frankly poor, though no worse than from other aircraft of this configuration.

The nosewheel is permanently linked with the rudder pedals and provides the only means of steering, the brakes working together only to stop the aircraft. But I found pedal forces light on the ground and I could turn about one wing-tip on wet grass. On squashy turf, with plenty of deep ruts, the ride was well damped, but roughish and noisy. Throttle and brake response were all one could desire. I was at first a little nervous of the high-geared steering, especially with the prospect of "steering small" when rolling fast after touchdown; but I finally concluded that the Colt has one of the best steering arrangements I have yet met. The aircraft pitched only moderately on rough ground and did not roll.

On take-off, full throttle gave about 2,500 r.p.m. of the maximum permissible 2,600 and the nosewheel lifted a little unwillingly at about 40 m.p.h. At 50 m.p.h. the Colt left the ground and accelerated very fast. I was alone, with a single tank full and no baggage, and noticed 1,400ft/min in one initial climb at 70 m.p.h. Creeping down the Woodstock Road south of Kidlington at a few hundred feet, I immediately noticed three Colt characteristics. The ailerons were very light and responsive (they are not coupled with the rudder as they are in the Tri-Pacer); longitudinal stability was just about right, with a distinct trim-change following power and speed variations; and the rudder stayed wherever it was put without any tendency to return to neutral. This aircraft had only flown 13hr and would loosen up a bit, but Colts apparently all have this non-centring rudder. Though it is easy to fly along skidding, the fact is distinctly noticeable by

seat-of-the-pants. The rudder proved very effective, high-geared and light and a lot of it was needed when entering or reversing turns or changing power, but it was not difficult to keep putting it where it had to be. At 2,350 r.p.m. (75 per cent power) the speed built up steadily to just over 105 m.p.h. Maximum manœuvring speed is 104 m.p.h. and V_{NE} is 138 m.p.h.

The general feel of the Colt was quite different from (and I would say much nicer than) that of the Tri-Pacer. At 95 m.p.h. I timed a roll from 60° left bank to passing 60° right bank in 3sec (i.e., 40°/sec) which could almost certainly be bettered with practice. At 60 m.p.h. I achieved 30°/sec, which is adequate. Throttled right back and trimmed out at the recommended approach speed of 70 m.p.h. (less than full aft trim) the Colt went downhill at 500ft/min, but this could be easily doubled by side-slipping at 70 m.p.h. i.a.s. The trim range was sufficient for a hands-off, power-off descent at 60 m.p.h. Nose-up surge after applying over-shoot power was much less marked than in the Tri-Pacer.

Keeping the v.s.i. at zero, I throttled back and slowed down. The nose came well up and then dropped very slowly at about 45 m.p.h. i.a.s. without any sign of a stall. With the control wheel still against the back stop, the Colt continued steadily down at 500ft/min. With 1,900 r.p.m., the nose came well up quite quickly and the aircraft then shuddered, with a minute right wing-drop, and dived steeply straight ahead. In the dive it immediately recovered and started up again, this time much more steeply. Again it fell—I was holding the wheel hard back all the time—and then reared to an impossible angle before dropping into a precipitate dive. There was no fully developed stall and little loss of height. The speed in this divergent oscillation varied between 42 and 38 m.p.h. i.a.s. Brochure stalling speed at full load is 54 m.p.h. I next dived with power off to about 65 and zoomed into what I hoped would be a full stall; but again the Colt fell gracefully away without really stalling. Light and responsive aileron remained throughout these manœuvres.

Obviously the Colt has deliberately limited elevator effectiveness and I therefore tried the g margin to assess its ability to round-out for a landing. At 70 m.p.h., power-off, I tweaked the wheel back and rattled the fabric easily. At 60 m.p.h. there was good response, but at 50 m.p.h. the nose was unwilling to rise acceptably. The moral—do not try to round-out firmly without power at less than 60 m.p.h. Such behaviour is very good for everyday flying, but instructors might like a firmer stall.

PIPER COLT
(Lycoming O-235-C1B giving 108 h.p.)

Span, 29ft 3in; length, 20ft; wing area, 147 sq ft; wing loading, 11.2lb/sq ft; power loading, 15.3lb/h.p.; empty weight, 940lb (Super Custom, 968lb); useful load, 710lb (Super Custom, 682lb); baggage capacity, 100lb; gross weight, 1,650lb. **Performance:**—Maximum speed, 120 m.p.h.; cruising speed at sea-level with 75 per cent power, 108 m.p.h.; optimum cruising speed at 7,000ft, at 75 per cent power, 115 m.p.h.; stalling speed, 54 m.p.h.; rate of climb at 75 m.p.h., 610ft/min; service ceiling, 12,000ft; take-off run, 950ft; landing run, 500ft; extreme range with standard tankage (15gal) at sea-level, at 75 per cent power, 324 miles; extreme range with 30gal fuel, at 75 per cent power, at 7,000ft, 690 miles.

I made several circuits at about 800ft in mist. The wing-root configuration as well as the weather interfered with visibility, but I was just able to lean forward and see the touchdown point when turning off the downwind leg for a short approach. Rocking the wings gave some sideways and upwards view. Descent gradient and forward visibility were very comfortable on finals and there was plenty of control to counteract the cross-wind during the float. The touchdown followed a longish float with the nose well up; and the nosewheel immediately went down on to the ground. Steering was high-geared and the ride noisy, but well damped.

Two more take-offs and landings confirmed these impressions. The Colt was completely straightforward on the ground and was easy to land and take off. Acceleration was very good and the brakes did not quite hold full power. The main wheels located fairly far back and the elevator limitation made me want to pull off the ground on take-off. I could not hold the nosewheel up at all after touchdown. Once I got the habit of putting the rudder where it should be, the Colt was very pleasant to fly. I made my last landing at 55 m.p.h. with some power and no difficulty at all.

Do not confuse the Colt with the Tri-Pacer. They handle very differently and, personally, I like the Colt much better as a pilot's aeroplane. I also like its neat trim and good amenities and, above all, its remarkably low price.

DOVE 8 "OPENS UP NEW HORIZONS"

THOUGH the sales fuze of the Dove 8 had been some time a-burning, the fact did little to dull the effect when the first purchase was announced last month. The new Dove was unveiled in June 1960; the first aircraft was accepted on December 21 and the official handing-over took place at a well-supported ceremony at Hatfield on Tuesday of last week.

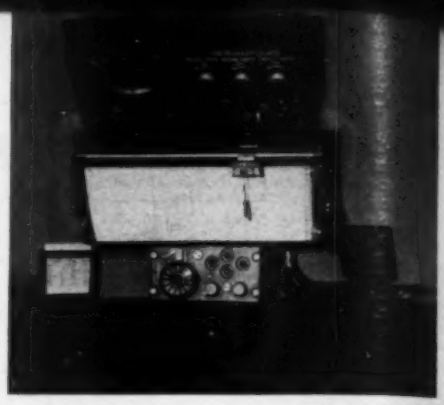
Christened *Exporter*, the first of the new Dove series has been purchased by hydraulic earth-moving equipment producers J. C. Bamford (Excavators) Ltd, of Rocester, Staffs. Diligent exporters themselves, this company send overseas 40 per cent of their total output; in two to three years—and by using business aircraft as a management tool—they hope to increase the figure to 60 or 70 per cent. "This aircraft," said Mr J. C. Bamford, the managing director, "opens up for us new horizons, new opportunities, new sales and new responsibilities." He went on to say that it was his opinion that within ten years no company employing 200 people or more could afford to be without a corporate aircraft. For his company, the Dove was the first of a series of business aircraft; and he added: "We shall be placing an order for a jet executive as soon as possible."

De Havilland's managing director, Mr H. J. Sturgeon, made it clear that the jet executive which Mr Bamford had in mind was the D.H.125. This was the first official intimation that D.H. may be re-entering the business aircraft field with a jet executive, understood to be powered by two new Bristol Siddeley Vipers developed from the Viper 12 but of higher thrust. From Mr Bamford's remark that an order would be placed "as soon as possible" it may be inferred that D.H. have yet to take the decision to go ahead.

Bamford's Dove was chosen after an unusually thorough evaluation for a corporate user of all competitive types, in the course of which Mr Bamford and his sales director Mr J. Skeldon visited manufacturers in the United States and on the Continent. Closest rivals for the order were the Beech D18S and Queen Air; but the Dove was chosen after it had been found that "it matches the American aircraft in almost every possible way." Points in favour of the Dove were the overhaul life of the Gipsy Queen 70 Mk 3 engines and almost on-the-spot after-sales and spares backing. Significantly, Mr Skeldon remarked that Bamfords had evaluated and purchased the aircraft entirely by themselves;

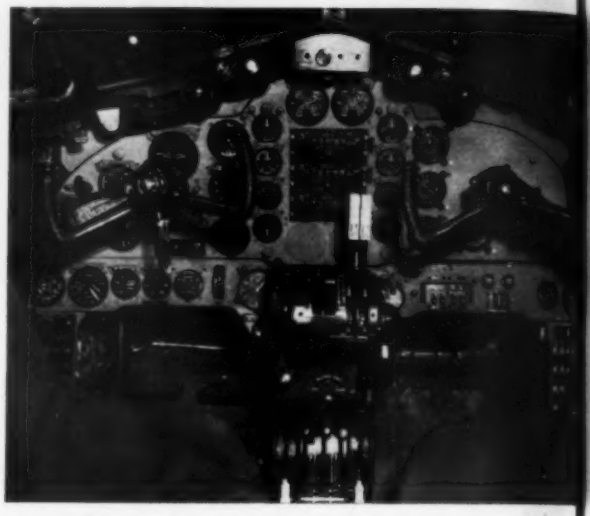
Chosen by J. C. Bamford Ltd after a comprehensive study of competing equipment, the first Dove 8 to be delivered is finished all-white with red fluorescent paint trim and polished cowlings. There are six seats and a toilet in a luxurious executive interior

Sport and Business . . .



"Flight" photograph

The business end of the extensive equipment in the J. C. Bamford Dove is centred on the instrument panels. Above is the Decca Mk 8 flight log, and below are the Collins radio, and Sperry Gyropilot controls and flight instrumentation



although they were keenly interested in operating an executive aircraft, "no one approached us and no one tried to sell us anything."

The Dove is at present based at Leicester East but will shortly be moved to Tatenhill, about ten miles south-east of Uttoxeter, where it will share Ind Coope's airfield with that company's executive Doves. Equipment in G-ARJB is superb; it has added about 80 per cent to the basic Dove 8 purchase price of £36,900. A more usual equipped price would be about £45,000.

Radio-navigational equipment is to full airline standard. Main and stand-by communications, VOR/ILS and marker beacon receiver are all Collins, the equipment specified being twin 17L-7A transmitters with 680 channels at 50k/c spacing, 880-channel 51X2B receiver, 880-channel 51X2 stand-by com/nav receiver, 344B-1 VOR converter, 51V-3 glide slope receiver and 51Z-2 marker beacon receiver. A Marconi AD722 lightweight ADF is installed and VOR or ADF bearing information is read off a Bendix RMI with ADF/VOR selector. The audio-system station box is Elliott ESB 31A.

In addition, the Bamford Dove is equipped with miniaturized Decca Mk 8 with flight-log above the screen, Deccometers and lane-position indicator on the starboard side of the grey one-piece instrument panel; Sperry Gyropilot with height lock (the first installation with this addition); de-icing; and long-range fuel tanks which extend the range to 1,100 st miles with reserves and reduced payload.

All this special equipment is intended to make it feasible to operate the aircraft on European airways with one pilot. The Dove will be flown for J. C. Bamford by Michael Sutton, who was previously with de Havilland in the drawing office and then as a production test pilot. Between accepting the aircraft in December and the handing-over ceremony last week he had flown G-ARJB 31hr by day and 17hr by night. In 17 days the machine had been used on journeys covering 6,410 miles and in five days Bamford executives had had 44hr of overseas conference time in five different countries.

THE YEAR 1960 was the most successful one in the history of the RAF Gliding and Soaring Association, whose members logged a total of 48,111 launches, 6,732 flying hours and over 15,000 cross-country miles during the twelve-month period ending on October 31. The Association has over 2,200 members in 15 clubs, and operates a fleet of 85 training gliders and high-performance sailplanes. The clubs are located at Ballykelly (Northern Ireland); Leeming, Driffield and Finningley (Yorkshire); Swinderby (Lincolnshire); Wattisham (Suffolk); Marham (Norfolk); Duxford (Cambridgeshire); Bicester (Oxfordshire); Wittering (Northants); Hornchurch (Essex); Booker (Buckinghamshire); Andover (Hampshire); and Upavon and Colerne (Wiltshire).

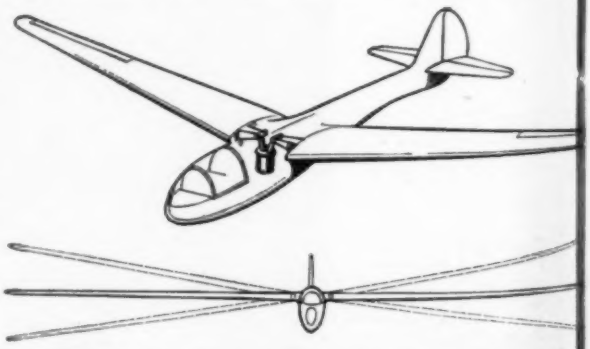
Last season's soaring achievements by RAFGSA pilots included an Olympia 2b flight by Flt Lt G. J. Rondel which established new records for altitude (30,500ft) and gain of height (29,100ft); a gain of height of 25,900ft in an Olympia 2b by Plt Off I. W. Strachan and a flight to 21,500ft in a T-42 Eagle—the greatest height reached by this type—by Flt Lt David Cretney. The Association's annual awards to *ab initio* members making outstanding progress in gliding were presented for 1960 to SAC H. S. Tee of the Wessex Club, Snr Tech D. F. Parry (Windrushers Club) and Cpl Tech M. Thomas (Moonrakers Club). Two new trophies for 1961 are the Bicester Cup donated by Mr G. H. Daniels for inter-station competition; and a trophy presented by Willis, Faber & Dumas Ltd, the Association's insurance brokers, for the club with the best safety record.

THE PROBLEMS of controlling a manpowered aircraft in flight will probably be greater than those of designing and building such a machine, according to Mr Lorne Welch, glider pilot and Microcell development engineer. This was the theme of a lecture, *Gliding and Manpowered Flight*, given by Mr Welch before the Manpowered Aircraft Group of the Royal Aeronautical Society on January 20. The paper considered in turn the possibility of applying manpower to existing gliders; thoughts on a number of configurations; and the process of flying a manpowered aircraft.

Although a small improvement in performance could theoretically be obtained by adding manpower to existing types of sailplane, the need to exert this power would detract from the pilot's concentration on soaring so that the indicated benefit might not in fact be obtained. The pilot would do better to stop pedalling, Mr Welch suggested, and to sit back and think.

A "conventional" manpowered aircraft, the speaker continued, might be based on something like the RHJ-6 sailplane. But people had been much too conventional so far in their approach: new ideas which ought to be considered included a two-man design with a one-man pod at each wingtip (and no central fuselage); and a "skimmer" type of wing-section giving stability in both pitch and roll without the need for controls. In more-orthodox designs both three-control and two-control systems were possible, but inaccurate flying would mean a big increase in drag.

In testing and flying manpowered aircraft, Mr Welch emphasized, gliding experience could help. Because of the light structures involved ground-handling would be important, and a trailer-type mobile hangar might be advisable. The low design factors associated with the weight limitation meant that flight-testing must be carried out near the ground—at less than about 15ft—in contrast to the normal glider procedure where as high an altitude as possible was preferred. For initial testing of a manpowered aircraft, Mr Welch recommended that a small power



Experimental Soviet sailplane known as Kashuk, designed by A. Manotskov, features a pneumatic shock-absorbent wing suspension. Wingtip movement is 4ft up and 4ft down, span is 55ft, and the wings may be fixed at a required dihedral angle while in flight

Tipsy Nipper G-ARDY is operated by Oxford Aeroplane Club at Kidlington. In the background are the offices of Oxford Aviation Co, subject of a news-item on this page

unit be fitted. Successful manpowered flight would demand a very good pilot who was also a well-trained athlete—a very rare combination. Using an engine, the early tests could be carried out by a non-athlete who could become thoroughly familiar with the flying characteristics of the machine. With the bugs out of the flying-control system, the engine could be removed and the athlete could take over.

The speaker put forward two suggestions for those aiming at the Kremer prize, which involves a figure-of-eight course around two points half-a-mile apart, starting and finishing at a height not less than 10ft. First, by starting near a pylon and not midway between the two, the pilot would need to climb only three times (and not four) during the flight. Secondly, very shallow turns would probably be worthwhile, in spite of the increased course distance. The four general rules which the speaker would suggest were (a) not to attempt anything new without a great deal of practice; (b) not to fly in high winds; (c) not to let interested friends have a go; and (d) to progress very slowly, step by step, checking carefully throughout.

RETROSPECT

From "Flight" of February 4, 1911

Another Balloon Wedding: For some reason or other the idea of getting married in a balloon did not become so fashionable in America as it was anticipated. A Texan couple, however, in search of the sensational, decided the other day that this was the only method to ensure their future happiness. Rising from the ground just by San Antonio, in Texas, in a balloon, piloted by Mr H. E. Honeywell, and accompanied by the Rev J. H. Adams, a Presbyterian minister, Mr Walter Stow and Miss Marie Shelton enjoyed the experience of being married in the clouds above their native city of San Antonio. The ceremony completed, the balloon drifted on for a honeymoon trip of thirty-five miles, when the balloon was brought down in a wood. After a walk of three miles the young couple secured a motor car which took them back to San Antonio.

OXFORD AVIATION COMPANY is planning a considerable expansion during this year, following its appointment as sole agent for Piper aircraft from Oxford to the Scottish border. A new building to house the company's training and charter unit has been completed at Birmingham (Elmdon) and a Tri-Pacer is based there. Several additional training bases are to be established in northern England during this year and six Piper Colts are on order. The Aztec and Apache of the Aircab charter service are busy at present with charter flights in Britain and abroad, and this service will receive another Apache next month. Oxford Aviation claim to be the only company in Britain now offering full charter service with modern, fully equipped five-seat business twins. Tri-Pacers are also offered for charter or hire, but are used mostly during the summer season. Two Tri-Pacers and two Caribbeans are currently available. The main training base at Kidlington, near Oxford, already offers instruction for PPL, CPL, instrument, instructor's and night ratings as well as refresher and conversion courses and full link training, the last-named being in association with Link Training Services Ltd. Similar facilities will be offered at the other centres to be opened.

By offering a three-pronged sales, charter and training service Oxford Aviation can make the fullest use of a large fleet of aircraft, and any one type of activity naturally encourages the others. There is considerable capital behind the project. The company is also convinced that modern, comfortable aircraft are essential to attract students, customers and buyers; and their policy is proving correct. It appears that a boom in chartering is accompanying the boom in business-aircraft buying. The chairman of Oxford Aviation is Mr Kerr Elliot and Rex Smith, formerly chief flying instructor of Oxford Aeroplane Club, is a director.

UNITED KINGDOM AGENT for Czechoslovak light and executive aircraft is now Peter S. Clifford and Co Ltd of Oxford Airport, Kidlington. This appointment was made by Gp Capt Edward Mole, the United Kingdom distributor for Omnipol of Prague. The first two types to be handled by the Clifford company will be the Aero 145 and the Meta-Sokol, and these are to be followed by the Morava and Zlin Trener. Demonstration aircraft will be operated from Kidlington.

FRENCH BUSINESS FLYING is evolving on lines very similar to those in Britain. There, too, there is a shortage of indigenous business designs, particularly light twins; and the restrictions on imports from abroad are even more severe. Aircraft of any kind are still classed as "war material" under customs regulations. France is nevertheless much better-off for home-designed aircraft than Britain and a large number of Jodel variants, including the Ambassadeur and Mousquetaire, are in service. The Wassmer Super 4 is also now in production, but there is no fast, luxurious single-engined type equivalent to the US Comanche or Bonanza.

It is reported in the French journal *Les Ailes* that the Fédération Nationale Aéronautique Française has formed a committee to examine the problems of business flying and that the government is now studying a "limited IFR" rating. It will be interesting to see in which country this new rating is first officially introduced. Meanwhile, some fairly severe regulations are likely to be introduced in the Paris area to separate positively non-radio and airline traffic. Presumably this is the result of the mid-air collision between a Stampe and a Caravelle near Orly last May.

Together with the familiar single-seat Druine Turbulent ultra-light aircraft in this recent picture taken at the Croydon factory of Rollason Aircraft and Engines Ltd are the wings and fuselage of the first Druine two-seater to be built by the company. Known as the Condor in France, this machine in its anglicized version will be named the Tutor. The Tiger Club is planning to fly a group of Rollason Turbulents to Moscow in May on the occasion of the British Trade Fair

Malaya to Middle Wallop

BY CAPTAIN MICHAEL SOMERTON-RAYNER

Part 1

The author and his wife Ina, seen on arrival at Middle Wallop after their flight in an Auster 3 from Malaya

THE trip was never meant to be an epic flight—just a holiday tour by aeroplane. The reasoning behind it was simple. I was posted to 656 Sqn Army Air Corps in Malaya in 1957, having just completed a flying course at Middle Wallop, and this was to be my first trip abroad at the Army's expense. My wife Ina and I were very excited at the prospect of 8,000 miles of sightseeing, but in the event we were flown out in a troop charter Hermes and saw absolutely nothing—taking 3½ days to see it, too.

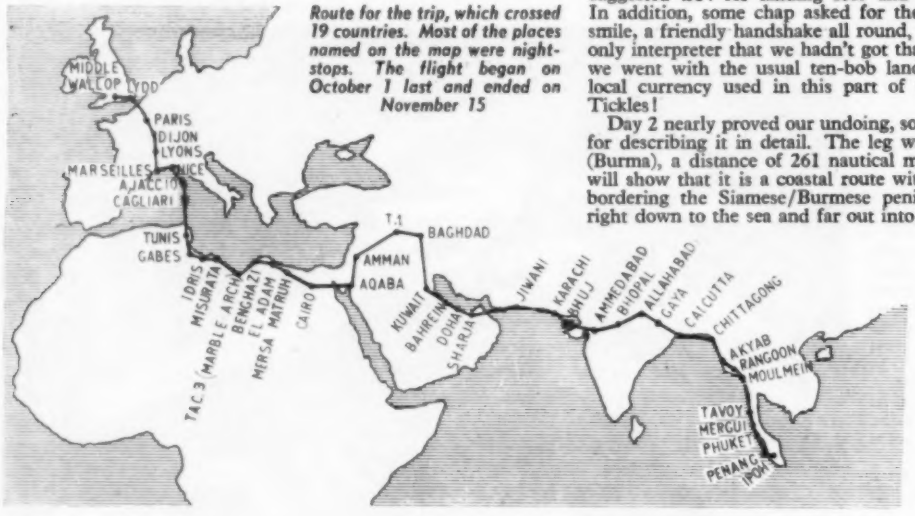
We were then very determined to put that right when it was time to come home and, as I was flying Auster AOP 9s every day in Malaya, the logical way to get home seemed to be to fly ourselves there.

Of course, one of the first things one requires is an aeroplane, and this is not easy to get in Malaya where, due to British ministerial influence, the private aviator is not encouraged and there are very few light aircraft. In October 1959, however, I managed to obtain an old (17 years) Auster Mk 3 for a reasonable sum from a club in Kuala Lumpur, and from that day our preparation for the flight began.

The aircraft, we found out, had returned to the fold, so to speak, for it had started life in the former 656 AOP Sqn RAF at the Burma front in 1943, and had served until 1947 when the squadron was disbanded and the aircraft sold to the flying club. My acquisition brought it back to 656 Sqn. Modifications before making the flight were obviously necessary, for the Auster Mk 3 originally had only a ten-gallon nose tank, and with a Gipsy 1 engine this gave a safe range of only 80 miles! The modifications were carried out by me, with the aid of Ina (now an excellent aircraft maintenance engineer), and were covered by a very sympathetic and helpful ARB in the form of Mr Johnson, the Singapore surveyor. The mods included the addition of a 25-gallon rear tank (total now 35gal), a Plessey radio, a full flying panel resembling an Auster 9 layout, electrics, generator and battery and, most essential, very comfortable seats.

Finally, for rescue purposes (and this subsequently proved an error) the aircraft was painted yellow—a good contrast to the jungle.

Flight-planning took a year, and a total of four hundred and twenty-eight letters. The plan went something like this. Out came my wife's school atlas and on it we drew the proposed route, the idea being to keep the water crossings to a minimum. From there we had to obtain some one-million maps. Two days later I happened to be in the planning section at the Royal Australian Air Force Base at Butterworth, picking up a target marking brief. I remarked "I'm flying an Auster to England soon; you don't happen to have the maps, do you?" Five minutes later I staggered out with the compete set. God bless Australia!



Route for the trip, which crossed 19 countries. Most of the places named on the map were night-stops. The flight began on October 1 last and ended on November 15

From these maps the route was plotted in detail and clearances were then sought via the Malayan Government, who went to an immense amount of work, and the fun started. Out would go the letters, and back would come the reasons why we couldn't use that airfield, why we couldn't fly over that part of Burma, the diversion for the Syrian border, the prohibited area in Iraq, and so on. It went on for months, but finally things started to sort themselves out and clearances gradually came through. Notable among these was the use of T.1 in Iraq, which arrived two days before we were due to depart; and Syria, clearance for which we still await.

Fuel was relatively simple to arrange with the local oil company, and we paid in advance, telling them where we wanted the fuel, what amount and the approximate date. However, it didn't turn out quite like that, because we wanted 73 Octane for our old bronze-head engine (since changed) and in some places it just did not turn up. Fuel proved to be our biggest worry.

The Flight. Saturday, October 1, 1960, dawned bright and relatively cool for Malaya, and we took off at 0730hr for Penang. Not far out of Ipoh we ran into light drizzle, but landed safely at Penang to clear customs, immigration and all the rest. This was a heavily escorted flight with a send-off of six Auster 9s from No 2 Reconnaissance Flt, Army Air Corps.

Airborne from Penang just after 0930, we were really on our way, although we still had the company of one Auster 9 flown by Capt Nigel Budd, who was on his way up to Alor Star, the Siamese border and the communist terrorists. The flight heralded a good beginning for the light rain cleared thirty miles north of Penang, the sun re-appeared and visibility went up to ninety miles. I like to be able to see where to land just after take-off, and it proved a good way to start Ina's navigation lessons.

Phuket came up 250 nautical miles further on in the right place, and with it our first night stop—and our first lesson that when you fly your own aircraft you become aircrew, ground crew, passenger, refuelling crew and tie-down service. Dealing with all these jobs and with customs formalities, it took two hours from landing to getting clear of the field. During the entire flight we rarely managed it in less time, in fact very often it took three hours, and the same time was required to get off again next morning. Of Phuket there is little to say—a hotel reminiscent of the state penitentiary; an enterprising but friendly set of local officials who suggested £14 for landing fees and £2 for customs overtime. In addition, some chap asked for the cash for the fuel. A big smile, a friendly handshake all round, and insistence through the only interpreter that we hadn't got that sort of money, and away we went with the usual ten-bob landing fee. Incidentally, the local currency used in this part of the world is measured in Tickles!

Day 2 nearly proved our undoing, so perhaps I may be forgiven for describing it in detail. The leg was from Phuket to Mergui (Burma), a distance of 261 nautical miles. A glance at the map will show that it is a coastal route with the Mergui Archipelago bordering the Siamese/Burmese peninsula, and jungle coming right down to the sea and far out into it with miles of mangrove

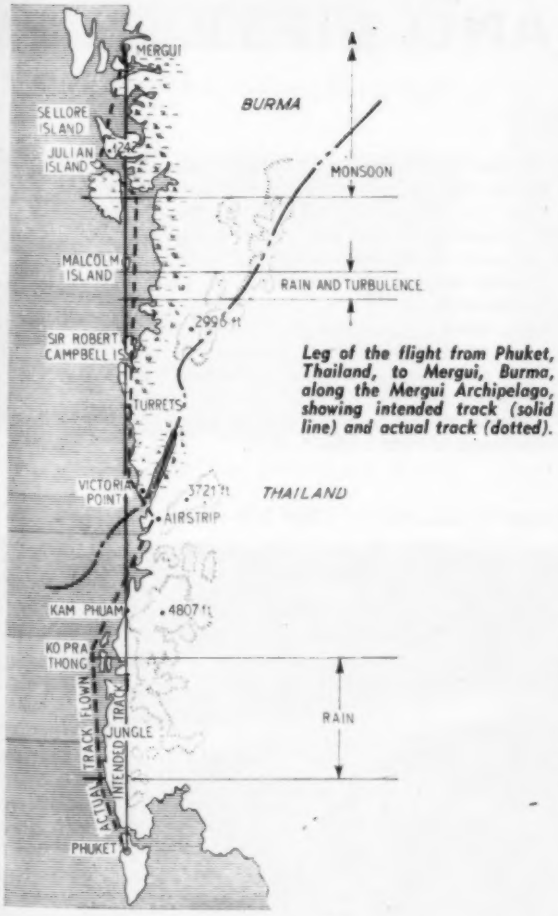
swamp. There is one airstrip between the two places, and this is near Victoria Point, 100 miles north of Phuket.

Airborne from Phuket at 0915, we flew steadily northwards. Because of low cloud at 700ft we found we could not pass the 3,000ft hills ahead and were soon forced out over the sea. Rain started and visibility dropped to half-a-mile, but always there was that light patch ahead which makes one go on. Opposite Ko Pra Thong Island, 20 miles west of track, the weather improved, visibility rose to four miles and then to forty. With the cloud base we rose to 2,000ft, and the rain stopped. Our spirits rose with the weather and we started to steam in a damp cockpit.

We picked up the site of the old wartime Japanese airstrip at Kam Phuam, the grass field at Victoria Point and a Dakota strip, and then we crossed into Burma. Past the British airstrip of Turrets (under water) and out over the uninhabited swamplands towards Sir Robert Campbell Island. Strange, but we could not see any more land beyond the island, just the grey sea. As we got over the island we realized that the grey sea and the grey wall of a huge thunderstorm had joined up. We could not skirt it and so into it we plunged. We were thrown about until our teeth rattled. My thoughts went back to our QFI, Maj Howard Southall back in Kuala Lumpur, saying: "Only fly into white storms; watch the greys, they are dangerous." This one, I realized, was black!

The shaking lasted for fully ten minutes and it was a tribute to the makers of the aircraft that it did not collapse. That glow of light ahead appeared just as the thought of turning back arose, and so on we continued. Finally it did get rather lighter, Malcolm Island went past and, still in fair rain, we got to within 20 miles of Mergui. This time the monsoon really struck us, or we struck it. Rain in solid sheets, cloudbase 300ft, forward visibility down to 50yd, and I could just see the surface of the sea when looking down through the side window. The rain got through every crack in the cabin, of course, and we were wet through.

This was hopeless, for my map showed a hill 1,242ft between us and Mergui. I groped for my radio facilities manual and hastily looked up Mergui—VHF homer on 117.9! Excellent. I flicked the channel selector and pressed the transmit button for an aerial



Leg of the flight from Phuket, Thailand, to Mergui, Burma, along the Mergui Archipelago, showing intended track (solid line) and actual track (dotted).

Refuelling facilities varied: in good company at Dum Dum Airport, Karachi (upper photograph) and more-basic service at Gaya

reading, only to get a despairing shriek in the earphones and not a flick on the needle. Water, water in everything; the set, the jump leads, and even the mask.

By this time things were getting out of hand, and I was having great difficulty controlling the machine in the turbulence and with the water so close. I laid a DR course to Julian Island, opposite the 1,242ft feature, and drove at the island with my fingers crossed. We came on to what must have been the island, 100ft higher than us as it suddenly loomed up ahead, and I hastily sheered off on a further DR course for Mergui field. Past Sellore Island, though we didn't see it, and then the surface of the sea gave way to swamp and we were over the land. We counted the estuaries as they came into our "pool of view," one, two, three and a big one, a golden pagoda and then a bit of metal runway —but we had gone past it.

A 180° turn and back again, and there it was; a sharp turn, engine off, flaps down and so were we. We switched off on the runway but, with the noise of the rain drowning everything, one couldn't tell the engine had stopped except by looking at the stationary propeller blade. We got out and went to look for the airfield control tower; it was half-way down the strip, in an attap (thatch) hut. The occupants were certainly pleased to see us, for we were an hour overdue.

We stayed at Mergui for two days and watched ten inches of rain fall in 48hr, but it was so wonderful just to watch the rain come down and be standing firmly on the ground. During our stay we sampled Burmese hospitality for the first time. Customs men fixed us up with somewhere to live (the magistrates' circuit houses); and aerodrome managers provided free transport into town, by jeep or pony cart, and took us to their club in the evening and to the temples and the golden pagodas.

On the third day the monsoon cleared and we took off for Tavoy, and with clear weather beyond we ran to Moulmein, Rangoon and on to Akyab, and then past the line of the Burma/Siam "death railway," the railway no longer there but its scar just visible through the jungle, winding its way up into the hills. After the huge cemetery at the old junction of the line to Sandaways we flew out of Burma into East Pakistan. Suddenly we were flying over paddy fields, and soon we started a gentle descent into Chittagong. We were flying high by this time and the instrument panel was liberally daubed with pencil marks—one for each time the engine misfired. Water had entered the works somewhere and there were now huge quantities of it in the fuel, presumably due to the rain. Daily drainage invariably produced an eggcup-full of water (and once produced a petrol-pipe-sized beetle). The frequency of engine misfires rose to a peak of ten per hour.

We became involved in a fair slanging-match on the RT with the controller at Chittagong, with one of the better Peter Sellers voices saying: "You have not got permission to land from my Government." Where he expected us to go I am not sure, but we certainly had no fuel to divert to another country. With a cheerful "We're coming in," we landed. That did it. We were besieged by angry customs men, immigration officials, controllers, in fact everyone seemed angry that day except the refuelling man, who said: "Don't worry, they're always like that." It took an hour of argument, waving my clearance paper at them, before we were clear.

We did not leave immediately, although we were sorely tempted after that treatment, for the nose cowl had developed a large crack. We were fortunate that one of the oil companies had a Dove stationed on the field, together with a ground engineer, and here we had a fine patch, strong enough for a battleship, riveted on the nose in about 40 minutes.

(To be concluded)

KLM: Seven DC-8-30 (P & W JT4A-3) and six DC-8-50 (P & W JT3D-3 turbofans)

Pan American: Seventeen DC-8-30 (P & W JT4A-3)

Delta: Two DC-8-10 (P & W JT3C-6) and four DC-8-20 (P & W JT4A-3)

UAT: Two DC-8-30 (P & W JT4A-3)

FIVE SCORE DC-8s AND FIFTEEN

Since the first Douglas Commercial jet transport flew on May 30, 1958, deliveries have been made to 15 airlines, now flying 115 DC-8s on commercial service. The total order book stands at 159, with deliveries yet to be made to five customers—Aeronaves de Mexico, Canadian Pacific, Iberia, Panair do Brasil and Philippine Air Lines. Illustrations of the aircraft for these airlines are not shown on these two pages, which are confined to aircraft in service; the most recent delivery is to Northwest, whose series -30 is shown on the ground. Panagra has not been included, nor Aeronaves. Although the latter operated a DC-8 from November 20 until the accident at New York on January 20, the aircraft was leased from Eastern.

Northwest: Five DC-8-30 (P & W JT4A-3)

Japan Air Lines: Five DC-8-30 (P & W JT4A-3)

Canada Air Lines: Eleven DC-8-40 (Rolls-Royce Conway RCo. 12)

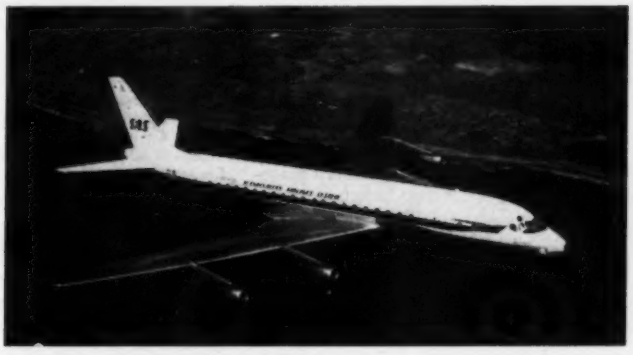
Swissair: Three DC-8-30 (P & W JT4A-3)

Alitalia: Eight DC-8-40 (Rolls-Royce Conway RCo.12)

United: Twenty-two DC-8-10 (P & W JT3C-6) and eighteen DC-8-20 (P & W JT4A-3)

TAI: Three DC-8-30 (P & W JT4A-3)

National: Three DC-8-20 (P & W JT4A-3)



SAS: Seven DC-8-30 (P & W JT4A-3)

Eastern: Sixteen DC-8-20 (P & W JT4A-3)

Straight and Level

WHAT'S this? A man with a civil aviation background and experience as a pilot appointed by the Minister of Aviation as chairman of the Welsh Advisory Committee for Civil Aviation? Pass me the smelling salts.

Doesn't the Minister realize that Sir Miles Thomas will, as chairman of BOAC from 1949 until 1956, know what he's talking about? Excuse me—another whiff. Ah, that's better.

Goodness gracious! What's *this*? Another man with a civil aviation background and expereince as a pilot appointed chairman of the Northern Ireland Advisory Committee for Civil Aviation? Not Wg Cdr R. C. Preston! But won't he know what he's talking about, too?

I must just have a little lie down. Shock, you know. I'll be all right in a minute.

● Extract from *Hansard*, January 24:

MR WYATT: "Does not the Prime Minister think that it is a crazy idea to have the Minister for Science at home pouring scorn on the practicability of a British space programme and the Minister of Aviation touring abroad trying to persuade other countries what a good idea it is?

"Would it not be much more sensible to have one Minister in charge instead of two Ministers taking different lines, and getting on with the job of providing a British communications satellite system which we could make a great deal of money with?

● A letter in *The Guardian*:

"*Sir*—On a BEA midweek night plane to Madrid (where there is a pricering) a one-year return ticket costs me £52 17s 0d. If I stay in the same plane 600 miles farther to Gibraltar and back (where there is competition with private enterprise) the fare drops to £30 10s 0d.

"One Minister appoints a Commission which roundly condemns pricerings. Another appoints a Board which adheres to a ring more blatant than any of them.—*Yours, etc.*"

● In his final "State of the Union" message, delivered on January 12, President Eisenhower said:—

"Not until 1953 were expenditures on long-range ballistic missiles programmes even as much as $1,000,000 a year.

"Today we spend ten times as much each day on these programmes as was spent in all of 1952."

This is the cover of an American publication which has just come my way and which has set my *Flight* colleagues drooling. It was nice of the publishers* to feature the Shuttleworth 504 so prominently—even if the caption does read: "Air-borne is the Avro trainer, a popular World War I plane." But it is full of interest for enthusiasts (including nitpickers) and for admirers of lovely pictures

● I have read Sir Percy Hunting's paper *The World's Future Air Transport Requirements*, which he presented last week to the Institution of Production Engineers as the 1961 Lord Sempill paper. It is competent, commendable stuff, marred only by the inclusion of a number of what I call OK expressions. For example: discipline (= method), SST (= supersonic transport), viable (= acceptable), lean (= economical). And R. Bacon, defender of our English aeronautical mother tongue, confesses to a little wince or two at some Americanisms in the paper. For example: obsoleting, envisioned, peppercorn rentals, fiscal, transportation, airline inventories, chewed up, and one or two others which I am sure Sir Percy doesn't normally use.

One aspect of this paper that caught the newspaper headlines is the suggestion that, for shorter journeys of the future, the airlines might carry a proportion of standing passengers. As I see it, the limiting factor on the number of passengers in a cabin is not cabin ventilation, as Sir Percy suggests (albeit lightheartedly), but safety.

A word or two with the ARB about the number of available emergency exits might, I think, be necessary—because it is this which puts the limit on passenger density. It doesn't matter about *breathing*. At least not if my experience of the 6 p.m. London Transport Underground discipline is viable.

● It is always rather smart to deny something which one's opponent never in fact actually said. Thus Sir William Hildred of IATA, in his recent reply to Lord Brabazon's arguments about the relative safety of JP.4 and kerosine, declared that JP.4 "is neither new nor highly explosive." One result of this statement was a report in an American paper that Lord Brabazon "*charged on a television program that major airlines were 'hushing up' their use of JP.4, a gasoline/kerosine mixture which he described as new and 'highly explosive.'*"

Of course, Lord Brabazon never said any of these things. But now lots of people who have never actually heard him think that he did say them.

● Collectors of curious facts should know that Silver City are flying a quarter of a million fresh eggs to Guernsey every month. The Guernseyman who imports the eggs says: "We seldom get more than half a dozen cracked eggs on weekly shipments of some 60,000."

You won't believe it, but his name is Mr Hamon.

And, if you can bear it, Silver City last week put out a news release on the subject entitled "EGGSELLENT ENTERPRISE." The release appeared on my desk with a note in the imperious hand of the Editor: "This one for Bacon."

● "If you listened to the ARB, old boy, you'd use an iron bar to hang your ties on."—*heard after Mr Le Sueur's lecture* (page 144).

ROGER BACON

*Sharon Publishing Corp, Division Street, Derby, Conn, USA. Price 75 cents.

Last week I said that if there is one thing that is always getting in the way of aviation it's trees. But there is another—birds. Man has tried everything to rid airports of birds, from amplified recordings of their warning cries to less sophisticated techniques involving fire and dynamite. Here is a Bell telling seagulls to SHOO from Miami Airport. They didn't

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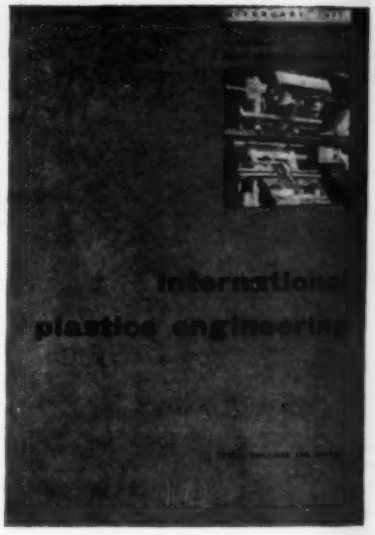

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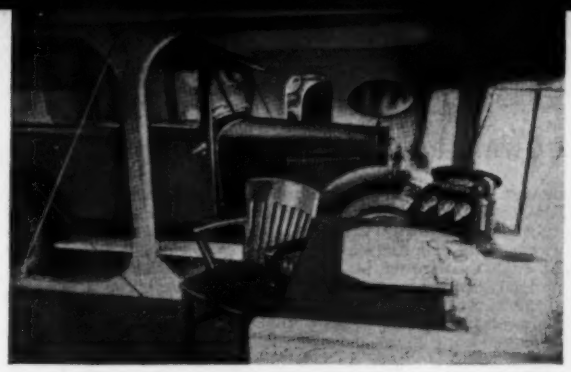


Car transport in the twenties (see letter in Col 2): this photograph from "Flight" for September 9, 1926, shows an Essex aboard a Remington-Burnelli RB-2, which carried it on a US sales tour

Correspondence

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. Names and addresses of writers, not for publication in detail, must in all cases accompany letters.

The Slush Bogy

YOUR article *The Slush Bogy* (January 20), in which you refer to the latest Civil Aviation Circular dealing with slush, comments that the publication is in time for the slush season; but many of us who have been following the Munich accident more closely are wondering why no mention is made of the slush season before that, or, indeed, the one before that.

In the Munich disaster of February 1958, a full account of the effect of taking-off in slush was available right from the very beginning. The pilot was able to describe how the aircraft suffered a deceleration during the take-off run and never achieved sufficient speed to become airborne as a result of running into slush; but no one except the British Air Line Pilots Association was prepared to accept the evidence. The German authorities dismissed the idea that slush could have caused the aircraft to behave in this way without even investigating the possibility, and wrote in their report, "All experience goes to show, however, that it may be assumed that take-offs can be made with nosewheel aircraft without danger up to a slush depth of at least 5cm" (2in).

At the time of the publication of the German report in this country, both BEA and the Ministry were in possession of information about slush drag; yet despite this they did nothing to investigate the evidence but were content to accept the German report and even use it as an instrument for disciplinary measures.

The position now is more clearly defined. The Minister, in recognizing the hazards of slush and in publishing limits for the Ambassador, discloses that this aspect has not been properly investigated by the German authorities. Surely then the time has come for the Minister to take some positive action to right this wrong by asking the German authorities to reopen their inquiry?

Warfield, Berks J. THAIN
Captain, G-ALZU

YOUR reference in *Flight* of January 20 to the Ministry of Aviation's Information Circular dealing with the effects of snow, slush and water on the take-off performance of aircraft prompts us to comment once again on the accident to G-ALZU at Munich on February 6, 1958.

This Information Circular will be welcomed by all pilots, as it goes some way towards clearing up doubts concerning operations from runways covered with snow or water and also will help to narrow down the number of conflicting opinions which have arisen during the past three years. However, the circular not only refers to the Elizabethan type aircraft but also to limiting depths of slush or water for a number of aircraft types. The average limiting depth appears to be 1in.

When the German Commission of Inquiry into the accident to G-ALZU published its report it made the following assumption:—

"All experience goes to show, however, that it may be assumed that take-offs can be made with nose-wheel aircraft without danger up to a slush depth of at least 5cm."

The Fay Commission made it plain that the criticisms made by the Association of the German report were justified. The German Inquiry implied an assumption that drag caused by slush decreased with the speed of the aeroplane. The Fay Commission pointed out that as a result of research initiated, partly at least as a result of the Munich accident, the drag caused by slush increases with speed; probably as the square of the speed. At the time of the Fay Commission the Association submitted that conclusions should never have been attempted until research had been done. For this and other reasons the Association has pressed for a reopening of the Inquiry or a review of the available evidence by a body fully qualified to determine the true cause of the accident.

Now we have the results of a Ministry of Aviation investigation into the general problem and these results conflict with the original German assumptions, therefore, we are saying that a serious error of judgment has been made in this case, which error needs to be rectified.

The Association has been accused of "irresponsible" conduct in insisting on a proper investigation and in being so unwilling to accept the original findings of the German Commission of Inquiry. If what we have been trying to do is "irresponsible" then we feel justified in carrying on in such an "irresponsible" manner, as our efforts and those of Captain J. Thain (who is directly involved in this matter) have helped to highlight what was until 1958 a hidden hazard to the safety of aviation.

Hayes, Middx D. FOLLOWS,
General Secretary, British Air Line Pilots Association

Fuel Duel

PERHAPS you will allow me to add (through the medium of your correspondence columns) another and as yet unmentioned aspect to the current kerosine-JP.4 controversy.

Referring to BCARs, Section D, Issue 2, one finds an interesting recommendation which is based upon emergency alighting conditions. This states in so many words, that when possible fuel tanks should not be located within the fuselage or the wing centre-section where it passes through the fuselage.

Although written as a recommendation there is much evidence to show that this is in fact a more mandatory note. A quick search through details of the types shows that not one piston-engined airliner produced in this country since the war has carried tanks in that region.

What is more, it appears that some similarly worded and equally enforced statement appears in the corresponding American publication. For with the exception of the Lockheed 1649 no American piston-engined transports have fuselage or wing-centre-section tanks.

This almost universal design feature has been reversed in the case of jet airliners. With the sole exception of the Caravelle they all rely on centre-section tanks for sufficient range. It can only be assumed that the authorities found this feature acceptable through an appreciation of the safer qualities of the fuel used, i.e., kerosine.

In view of this, and bearing in mind their past recommendations concerning piston-engined aircraft, it would appear logical that these authorities could, and perhaps should, invalidate the airworthiness certificates of jet airliners operating with petrol/JP.4 in their systems.

Barnet, Herts R. A. COLE

[The D.H. Trident—the initial version at least—does not have centre-section tankage.—Ed.]

ROUND ONE of the 'fuel duel" has ended in stalemate, with the JP.4 proponents asserting that wide-cut distillate actually improves engine mechanical reliability. Turbojet fuel systems rely mainly on fuel lubrication. Various makes of turbojets have certain fuel system components restricted to reduced overhaul life when operated on JP.4, this reduction being proportionate to the JP.4/kerosine running ratio. These restrictions resulted from increased mechanical wear encountered because of the inferior lubricating qualities of JP.4.

The degree of reliability imparted by the respective fuels is best considered in the light of the fact that some types of fuel-lubricated fuel pumps may be restricted, when operated on JP.4, to 50 per cent of the life permitted with kerosine.

The inferior lubricating qualities of JP.4 must affect the ultimate obtainable reliability (and synonymous safety) of any fuel-lubricated mechanism on the engine.

Glasgow S2 NEIL MCKAY

Airborne Cars

WHILE looking through a copy of *Popular Flying* for April 1932, I came across a delightful and interesting photograph showing an Austin 7 sports car being loaded into a Junkers G.31 of Guinea Airways. A cumbersome derrick was lowering the car vertically through an aperture in the fuselage above the centre-section and the caption described it as the first motor to be used in the goldfields of Wau.

This is certainly the earliest picture I have seen of a motor vehicle being transported by air although I believe that this was not the first occasion. I am told that a car was first carried in an aircraft round about 1927 in America, the aircraft probably being the Remington-Burnelli RB-2 of 1924 which was one of the predecessors of the later "flying wing" aircraft bearing the name of Burnelli. Powered by two 520 h.p. Galloway Atlantic engines

CORRESPONDENCE . . .

mounted side by side in the nose of the very broad fuselage, the RB-2 had a volumetric cargo capacity of 14ft×15ft×6ft 6in.

In view of the pioneering work performed by Silver City Airways in the commercially successful carriage of vehicles by air I would be interested to know whether these details of what was probably the first four-wheeled vehicle to be carried by air are true.

Has any reader further information concerning these or earlier flights and is there any *Flight* illustration available [there is: reproduced on page 155.—Ed] of the Remington-Burnelli carrying a vehicle in the late twenties?

Windsor, Berks — LOUIS WILLDEY

"Do-It-Yourself" Escape (2)

THE "do-it-yourself" escape mentioned in your issue of December 16 last recalls a flight from Denmark to this country early in 1944. When stationed at Turnhouse with 63 Squadron, RAF, I saw a Danish biplane in one of the hangars, which was probably of Kramme & Zeuthen manufacture, and very similar to a Tiger Moth in appearance.

This machine had a Union Jack painted on each side of the fuselage, level with the rear cockpit which was filled by a large petrol tank, very much a "one off" and evidently owing much to the makers of biscuit tins. I particularly remember the liberal amount of solder used at each seam.

The magneto fitted was adapted from one removed from a lorry —the original having been removed by the Master Race, when immobilizing the machine following their "heroic" capture of Denmark in 1941.

We were told that the engine had had to be run-up and tested for very limited periods prior to the flight, during which the exhaust was piped into a pit below the hangar floor. Take-off was at night and the North Sea crossed at low level, the Scottish coast being reached early in the morning.

I do not know where the landing took place or whether the machine was intercepted by our fighters.

No doubt other readers could provide more details of this very creditable exploit, which contains several elements of "do-it-yourself."

Keighley, Yorks — D. HATTERSLEY SMITH

Renfrew Replacement

I HAVE followed with interest the correspondence in your columns regarding the Prestwick-Abbotsinch controversy, since the announcement featured by you on November 25 last. To a neutral observer, which I think I can reasonably claim to be, the cost, a reputed £3m, of converting Abbotsinch into the main civil domestic airport serving Glasgow, seems hard to justify in view of the proximity of Prestwick, especially when one considers the marginal advantage which the former can claim over Renfrew.

However, I am not at all convinced that even the advantages of Prestwick make it the ideal choice for the city's new airport. The problem is a commercial one: all your correspondents have placed much weight in their arguments on the relative distances of the two places from Glasgow's city centre: what do a few miles or minutes matter when comparing the total travelling time with that by rail or road? This being so, I am surprised that no mention has been made of a third airfield, namely Turnhouse, which at present serves Edinburgh. Here we have a main 6,000ft runway, the same as the proposed effective length at Abbotsinch, a terminal building which could be developed up to required size for a fraction of £3m (I should say it is about due for extension anyway, to cope with present summer traffic) and an open situation to the west of Edinburgh at hardly any greater distance from the centre of Glasgow than Prestwick, if we must have regard to the distance factor. The runway could be developed to an almost unlimited extent by closing the Linlithgow road: this is not nearly such a drastic step as it sounds; the road was closed for many years after the war and even today, all traffic is stopped when aircraft take off and land in certain directions.

I believe that Turnhouse, linked as it is by good roads to Glasgow and central Scotland and within a short distance of the southern approach road to the new Forth Road Bridge (due to open about the time Renfrew closes) could easily be developed to become Scotland's primary domestic airport. Weather conditions are considerably better than those all too frequently prevailing in the west. In addition, it is a fact that fully half the population of Scotland is within an hour's travelling time in any direction.

Before I am martyred by all your Glasgow correspondents who shudder at the thought of visiting the city of their traditional "enemies" in order to make a flight, I should like to add one further point. Mr Cameron has pointed out that it is BEA's regrettable policy to centralize on London: at present, Glasgow certainly, and Edinburgh possibly, could support direct flights to the Continent; undeniably together there must exist a strong case for through flights to several cities in north-west Europe. For example, reduced-rate night-flights to Paris and Brussels, nonstop from Scotland, would, I am sure, prove tremendously popular, if given a proper chance to catch on. Just as important, they would have the very considerable effect of reducing traffic density at London Airport, since many people travelling from there to the aforementioned cities on the Continent must be transit passengers from elsewhere in the British Isles.

London W5 — BRYAN J. GALL

Certify or Certificate?

WAS it not the admirable Mr Bacon who was complaining only a few weeks ago about American mal-constructed words? I fully support him in this course and, as sure as eggs are eggs, know he would be sizzling when he read last week's *Flight*. For, therein, a *bête noire* has escaped the pen of an "Air Commerce" correspondent, and I feel sure that streaks of lightning (and of Bacon, to say nothing of a roasting in the oven) are just rewards for such carelessness. Perhaps, on the other hand, this correspondent has never heard the adequate and tasteful word "certified." He should, of course, have used this in his discourse on the D.H.121 Trident and the Boeing 727.

Bromley, Kent — CHARLES G. SMITH

[OED gives the following definitions: *Certificate:* To attest by a certificate. To furnish with a certificate. *Certify:* To make (a thing) certain; to guarantee as certain; to give certain information on. To declare or attest by a formal or legal certificate. "Certificate" is thus amply justified.—Ed.]

Chichester and Post

WITH reference to John Grierson's interesting letter (November 25) and with all respect to his own opinions of the history-making 1931 trans-Tasman flight by the great British pioneer, Francis Chichester, with a Gipsy Moth seaplane, may I submit my own choice of the most outstanding *solo* pioneering made in the early 1930s, taking fully into consideration all relative factors.

The late Wiley Post in his original Lockheed Vega *Winnie Mae* encircled the globe, solo this time, in July 1933—New York/Berlin/Rukhlova/Novosibirsk/Flat (Alaska)/Fairbanks and so back to New York, some 15,596 miles, in the (then) fantastic time of 186hr 49½min including time on the ground between "hops." Bearing in mind the fact that Wiley Post flew always under the handicap of having only one eye, plus his fantastic stamina for a man of his age, plus his superb knowledge of air navigation (no doubt learned from Harold Gatty), I believe this last world-flight of his still remains, even today, the greatest air-navigation feat ever.

It is, of course, true that Post chose most carefully the essential cockpit instruments for his aircraft, including blind-flying instruments and artificial horizon, also air temperature indicator. But remembering, although he had radio in his aeroplane, he didn't find it to be of any use to him whilst flying across the vast stretches of the Soviet Union.

Nairobi, Kenya. — DENNIS M. POWELL

CORRESPONDENCE IN BRIEF

A 14-year-old schoolboy, Michael Brown, writes from 20 Ainsty Road, Wetherby, Yorks, to say that his school is starting an aero-club. As it is "desperately short of equipment," he appeals to the generosity of *Flight* readers for old books or photographs or "anything at all to do with aircraft."

FORTHCOMING EVENTS

Feb. 7. RAeS Astronautics and Guided Flight Section: "An Appreciation of Missile Structures," by A. F. Newell.
Feb. 8. Kronfeld Club: Film Evening.
Feb. 8. RAeS Graduates' and Students' Section: "Flight Testing of VTOL Aircraft," by T. W. Brooke-Smith.
Feb. 8. Women's Engineering Society: "Spaceflight," by L. J. Carter.
Feb. 9. Aslib Aeronautical Group: RAE film on Black Knight and lecture on scientific publications by Capt I. R. Maxwell.
Feb. 10. RAeS Man-powered Aircraft Group: "Insect Flight," by Dr J. W. S. Pringle.
Feb. 15. BritIRE (Merseyside Section): "Inertial Navigation Systems," by Wg Cdr E. W. Anderson.
Feb. 15. Society of Environmental Engineers: Discussion on The Development and Testing of Small Electronic Components.
Feb. 15. Kronfeld Club: "Special Air Services Operations in the Oman," by Col Tony Deane-Drummond.
Feb. 16. REeS: Cierva Memorial Lecture, "The Era of the Autogiro," by Prof J. A. J. Bennett.
Feb. 21. RAeS: "New Metallic Materials of Construction," by Dr N. P. Inglis.
Feb. 23. Aerodrome Owners Association: a.g.m. and Dinner.

RAeS Branch Fixtures (to Feb. 10): Feb. 6, *Derby*, Paper Competition and Film Show; *Henlow*, Fourth Trenchard Memorial Lecture, "The Nuclear Deterrent," by Prof N. H. Gibbs. Feb. 7, *Gloucester*, "Military Air Transport," by Gp Capt F. C. Griffiths. Feb. 8, *London Airport*, "Some New Developments in Aircraft Propulsion," by Dr S. G. Hooker; *Manchester*, "Man-powered Flight," by T. R. F. Nonweiler; *Preston*, "Trends in Aircraft Propulsion," by H. Pearson; *Southend*, Film Show. Feb. 10, *Preston*, Annual Dinner and Dance.

FLIGHT SYSTEM SURVEY

Radar for the RAF

THE RAF has ordered from Cossor Radar and Electronics Ltd an undisclosed number of CR.787 surveillance radars with a value "well into the six-figure bracket." The RAF has already taken delivery of a small number of mobile CR.787s, each of which can be transported in a single aircraft, but the present order is for fixed installations with duplicated transmitter/receiver. The CR.787 is an S-band surveillance radar incorporating MTI and switchable circular polarization (by means of a quarter-wave plate) to cancel terrain and weather returns. Detection range on a 10 sq m target is up to 40,000ft and 75 nautical miles; and gap-free coverage without aerial tilting is claimed. The displays ordered with the radar have not been announced, but the CR.787 can accommodate the Cossor CRD.23 system.

Proposed Secondary Radar Standard

THE Ministry of Aviation has now issued a document, entitled *Minimum Performance Required of Civil Transponder: January 2, 1961*, which sets out in detail the operating characteristics of transponders. It is stated that two pulse side-lobe suppression will be mandatory in Mode B and that the UK considers this facility to be essential for any civil transponder operation. Together with the Federal Aviation Agency, MoA have formulated a standard for three-pulse side-lobe suppression for Mode A and are proposing this for standardization by ICAO in addition to the two-pulse system already accepted.

An experimental Cossor secondary radar is already operating at London Heathrow with two-pulse suppression in Mode B; and the carriage of suitable transponders will become mandatory in certain areas, initially above 25,000ft, when this becomes operational. The minimum height will be progressively lowered as re-equipment programmes progress.

The new Kelvin Hughes twin-pointer a.s.i., showing the two needles aligned for low-speed indication (left) and the short needle indicating 310kt on the inner scale with the long needle trapped so that only its black portions are exposed, and barely visible

Twin-needle Airspeed Indicator

KELVIN HUGHES have announced a new twin-pointer a.s.i., which is illustrated here. Applied as a stand-by a.s.i. to supplement the computer-operated instruments in the Trident, the new a.s.i. will be driven by a conventional capsule mechanism, but the single shaft will carry two needles and cover the speed range from 60kt to 430kt in two revolutions. There are two concentric, linear scales marked in 5kt increments and, at speeds below 250kt, both the indicator needles overlap to point in an almost solid line to the outer edge of the dial. As the needles reach the beginning of the second turn, the white head of the longer needle is trapped underneath a black cover, leaving the shorter needle alone to indicate against the inner scale. The needles are connected by a hair-spring to allow the short needle to move independently while the long needle is trapped. A similar instrument, but with a capsule-operated, striped needle showing V_{NE} and a marker for V_R, is to be provided as a main instrument for the VC10. A two-needle r.p.m. indicator is also being developed.

General Electric high-intensity approach, threshold and runway lights recently installed at Guernsey Airport (see news-item in column 2)

A Cossor CR.787 static surveillance radar installation of the type which has been ordered for the RAF (see first news-item)

Computer Century

MORE than 100 digital computers have now been ordered from National-Elliott. Thirty of them were delivered last year and the present back-log of orders is for 25. Nearly half the orders have been for the National-Elliott 803 transistorized machine; and they have come from six foreign countries, including America and Russia. Plans are now in hand to double the output of these computers.

Lighting for Guernsey

THE new 4,800ft runway and taxiways at Guernsey have been equipped with General Electric lighting at a cost of £19,500. The installation was completed by the States of Guernsey Electricity Department. The edges of the taxiway and apron are lined with blue, flush-mounted lamps and the apron is floodlit. Along the edges of the runway itself are high-intensity bi-directional lights wired in two series circuits with individual transformers at each light, the brightness being adjustable in four steps. The threshold at each end is marked by high-intensity unidirectional lights and wing-bars with green filters.

Two sets of approach lighting, 2,000ft long at the western end and 1,400ft long at the eastern, include 100ft-wide cross-bars and centre-lines in white lighting and omni-directional, low-intensity red lights. These are also wired in two separate series circuits so that a circuit failure will only affect alternate lights. Brilliancy of both low- and high-intensity lights can be adjusted and the whole system is controlled from a single switch panel in the control tower.

Radio for UAA Comets

A FURTHER order has been received by Field Aircraft Services Ltd, UK distributors for Bendix Radio, for light-weight radio and radar, to be fitted to the two additional United Arab Airlines Comet 4Cs recently ordered. The new order is worth £25,000. Bendix radio was also fitted to the first three UAA Comets.

The new administration block for BEA's engineering base at London Airport is fully air-conditioned and soundproofed (noise-level in the offices is 43db). Main contractors were Holland & Hannen and Cubitts, the architects Murray Ward & Partners; civil engineering consultants were Scott & Wilson, Kirkpatrick & Partners, with Roger Preston & Partners consulting engineers for all mechanical services. Main heating and air-conditioning contractors were Benham & Sons, with York Shipley Ltd supplying refrigeration machinery. Barlow, Leslie & Coombes were electrical consultants

THE INDUSTRY

Blackburn Prizegiving

AT the Hull Guildhall on January 16 the managing director of the Hawker Siddeley Group and chairman of Blackburn Aircraft Ltd, Sir Roy Dobson, presented merit awards to nearly 200 Brough apprentices. In his speech he referred both to opportunities for apprentices in the aircraft industry ("there is," he said, "a great scarcity in business today of men capable of management, and this is where apprentices come in") and also to Blackburn Aircraft Ltd. Sir Roy affirmed that Blackburn had "a very good set-up" in aircraft, engines and electronics and were very welcome members of the Hawker Siddeley family. Every company in the Group retained its own identity with its own board and its own management, but the Group organization could help because of the great technical and financial resources that were available.

The deputy chairman of Blackburn Aircraft, Mr A. F. Jopling, presided at the ceremony and introduced the company's technical training officer, Mr T. A. Wolstenholme, who in his report said that the number of boys under training (450) showed an increase of approximately 8 per cent over last year. Mr T. Bancroft, production director, presented the directors' prize—for the best all-round craft apprentice of the year—to C. B. Goodens.

Seven Years' Service

AT the Bristol Siddeley test-beds at Brockworth, near Gloucester, five centrifugal pumps manufactured by Girdlestone Pumps Ltd, Woodbridge, Suffolk, have in seven years' operation recirculated well over 100m gallons of aviation fuel without a single breakdown. The test-beds are in use day and night and the pumps have run 24 hours a day continuously since 1953. For the first time since they were installed, one pump has just been overhauled. Fuel is continuously re-circulated by the pumps, the excess being returned to the storage tanks.

The fuel has to be pumped from 12 large storage tanks along overhead pipes to the engines on the ten beds, some of which are 40yd away. The pumps which supply the beds, driven at 1,440 r.p.m. by 5 h.p. electric motors, supply 7,200gal/hr and deliver it at the engine inlet pressure of 28lb/sq in. Three more Girdlestone pumps are used exclusively for pumping fuel from tankers into the tanks, and one pump can empty a 4,000gal tanker in 20min.

Tubular Simplicity

A NEW product, Clinch-type joints, has been announced by Access Equipment Ltd, Maylands Avenue, Hemel Hempstead, Herts. Described as "an ingeniously simple method of connecting one structural tube to another without the need of welding, screwing, bolting, etc," the device should have numerous applications in the construction of racking, staging and similar factory equipment. The joint operates on a simple friction system with spring loading. The joint is slid over a tube and its spring spigot stems compressed with a self-locking wrench or spanner and inserted into the tube to be connected; the joint is then consolidated in position with a hammer or mallet. The joints (elbow, tee and cross) are for 1¼in o.d.×16 s.w.g. tubing, and a 1in size will be available in April; other sizes will follow.

At the Blackburn prizegiving: Above, l. to r., Mr A. F. Jopling, deputy chairman; Sir John Slessor, director; Mr Charles Ward, London office. In the picture on the right Sir Roy Dobson is presenting a prize to apprentice W. Bishop (see news-item, Col 1)

IN BRIEF

The R.F.D. Co Ltd associated company in Germany, Hanseatische Rettungsgerate Fabrik GmbH of Hamburg, have opened a new factory for the production of R.F.D. equipment.

An initial order for 22 Turbo Taskmaster aircraft towing tractors, for use by the Royal Netherlands Air Force, has been placed with David Brown Construction Equipment Ltd, Meltham, Huddersfield, Yorks.

Mr Morley A. Griffith-Jones, OBE, has been appointed general sales manager of Chloride Batteries Ltd, Exide Works, Clifton Junction, Swinton, Manchester. He joined the company in December 1959 and took over his present post on January 2 this year.

Armstrong Whitworth Aircraft Ltd and Alvis Ltd were among firms participating in *A Coventry Achievement*, an exhibition staged recently by Owen Owen (Coventry) Ltd. AWA featured the Argosy as "Britain's best-selling aircraft in 1960" and stated that 11,000 workers are now engaged on the aircraft, on Seaslug and on other projects; Alvis exhibited a Leonides 531, with models of the aircraft in which it is installed.

Auto Diesels Ltd have received a contract from Middle East Airlines for a number of ground power units for starting and servicing their new D.H. Comet 4Cs. Each unit consists of a standard G.P.U.3 mounted on a Rootes Gamecock chassis. The generators are Crompton-Parkinson, with continuous rating at 28V output 21kW, 750A; and at 112V output 44.8kW, 400A. Overload ratings are 56kW, 2,000A and 95.1kW, 400A respectively.

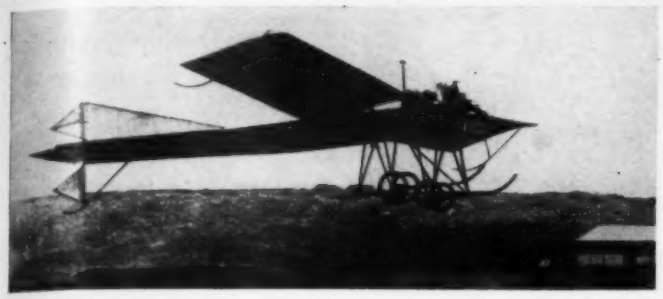
Mr W. L. Watson, formerly works manager at the Northampton factory of Pollard Bearings Ltd, has now moved to the company's principal works at Ferrybridge, Knottingley, Yorks, as works manager.

The British Oxygen Co Ltd, whose a.g.m. is to be held on February 15, have announced a group profit of £9,515,941. This compares with £8,587,144 after depreciation of £4,747,023 (£4,339,723 last year). The profit increase, £928,797, came almost entirely from sales expansion overseas.

The special products division of de Havilland Aircraft of Canada Ltd has moved into new premises at the Downsview, Ont, factory, taking over the former engine division establishment and its engine and propeller work. This move follows the recent trend towards greater diversification in the division's activities.

Ten new and revised British Standards in the aircraft series have just been published by the BSI, British Standards House, 2 Park Street, London W1. They form part of a series dealing with textiles for aeronautical purposes and refer to the use of hemp cord, linen and cotton thread, flax cord and cotton cord.

Normalair Ltd have received contracts worth some £42,000 for the overhaul and repair of cooling turbines and liquid-oxygen converters for Republic F-84Fs of the Federal German and Belgium Air Forces. There are 140 cooling turbines and 220 liquid-oxygen converters involved, and the first units are already going through the company's workshops.



Blackburn Mercury, 1911-12. Right, page from the 1911 Dunlop catalogue

THE DUNLOP AEROPLANE TYRE.

A special tyre suitable for aeroplanes is manufactured by the Dunlop Company: evidence, if any were required, that the Company is thoroughly up-to-date in its productions. It is the lightest possible tyre, consistent with necessary strength.

WIRED-ON TYPE ONLY.

Sizes:—

24-in. × 2-in. fits 22-in. × 2-in. rims; 26-in. × 2-in. fits 24-in. × 2-in. rims; 26-in. × 2-in. fits 26-in. × 2-in. rims.

This tyre when fitted to the special rim supplied by the Dunlop Company just over-rides, so that in descending there is no possibility of damage to wheel or rim.

Dunlop's Aviation Jubilee

FIFTY YEARS' WORK—ON TYRES AND MANY OTHER PRODUCTS

THIS year the Dunlop Rubber Co Ltd is celebrating the golden jubilee of its association with aviation. Strictly speaking, perhaps, the fifty-year period has already been exceeded, for aeroplane tyres and wheels were advertised in the Dunlop Pneumatic Tyre Company's catalogue of 1910 (rims appearing at the modest price of 2s 8d each). In the following year the company was advertising wired tyres on well-based rims, which provided a greater measure of safety, especially in cross-wind landings, than did the ordinary beaded-edge cover. Few records seem to exist of the names of aircraft to which these early Dunlop tyres were fitted. It is known, however, that at least one of the series of Blackburn Mercury monoplanes built in 1911-12 was thus equipped. The Mercury, as can be seen in the heading picture, had what was commonly known as the Farman type of undercarriage, with paired wheels. Another early type which is believed to have had Dunlop tyres was the Coventry Ordnance Works biplane designed by W. O. Manning and Howard Wright for the 1912 Military Trials.

The name Dunlop in early aviation was not associated with tyres alone. In *Flight* for May 27, 1911, is a reference to "samples of two new fabrics, intended for use in surfacing aeroplanes, which have reached us from the Dunlop Rubber Co Ltd." "Single-faced cotton" was priced at 1s 10d a square yard and "double-faced cotton" 2s 1d. That Dunlop were well aware of the value of aviation as a publicity medium was proved by a photograph in another 1911 *Flight* issue of two balloons carrying the name and made for the company by Short Bros of Battersea.

During the 1914-18 war most of the Dunlop tyre effort was towards land transport, but in the later stages of the conflict their general engineering side was producing starters for Rolls-Royce Eagle engines and cylinders for the Gnome. In 1919 the company moved its wheel manufacturing activities to the present site at Foleshill, Coventry, and a much closer connection with the aircraft industry began.

In the 1920s Dunlop tyres began to appear on many famous types such as the de Havilland Moth and they were used on the Siddeley Siskin on which F. T. Courtney won the 1923 King's Cup Race. By 1925 the company considered it well worth while to form a special aviation division to operate in close collaboration with aircraft constructors, as is still the case today. From the largest to the smallest, aircraft were beginning to be equipped with Dunlop tyres. One of many famous examples was the D.H. Hercules *City of Delhi* which at the close of 1926 inaugurated the Imperial route from England to India, with the then Air Minister, Sir Samuel Hoare, as one of the passengers.

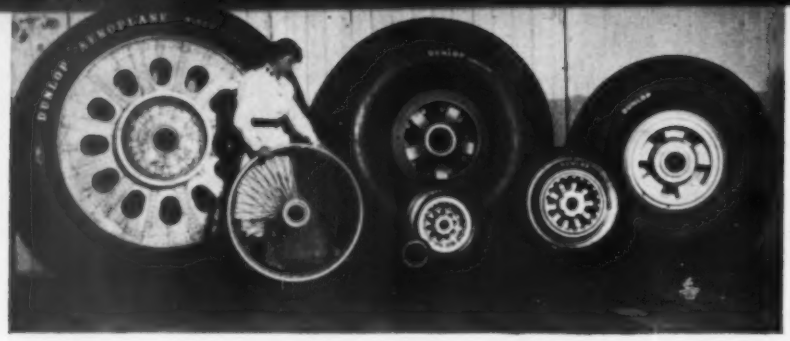
The ever-increasing size and weight of aircraft were now creating plenty of problems for the Dunlop designers, and they probably faced their highest hurdle in the Beardmore Inflexible, an experimental aircraft which first flew in 1928 and which had a loaded weight of some 20 tons. "The large Dunlop [main] wheels must have presented a pretty problem in design, having to carry a load of something like 7½ tons each," commented *Flight* at the time. These wheels consisted of steel rims riveted to light-alloy discs; the tyres, although nearly 8ft in diameter, still followed the narrow section commonly used on road vehicles.

By 1929 wire wheels were being replaced by disc wheels and in the early 1930s Dunlop equipment of this type was seen on such famous civil transports as the Handley Page H.P.42 and the Fokker monoplanes.

Meanwhile, the Dunlop engineers were busy on brake development, and in 1930 their first differential brake was demonstrated on an Avro Avian. The segmented friction pads of this brake were applied by means of an air-pressurized radial rubber tube. In 1934 a similar system was developed, but with hydraulic fluid

Left, Dunlop tyres on the wire wheels of the D.H. Hercules "City of Delhi." Centre, one of the enormous wheels of the Beardmore Inflexible. Right, the Avro Avian on which Dunlop differential braking was introduced

Dunlop's Aviation Jubilee . . .



Variety show: an assortment of wheels and tyres manufactured between 1912 and 1940

taking the place of air. Further refinements were to follow: "pressed-in" brake drums were replaced by isolated drums to prevent heat transfer to the tyres, and bi-metal drums were introduced to improve heat dissipation and prevent distortion; such brakes, Dunlop record, were used on all British fighters during the war.

In the years immediately before the war the company's technical effort became intense, extending far beyond landing gear. The Dunlop fluid anti-icing system and the "Ecta" static-conducting tailwheel were announced, and very soon the company's famous pneumatic gun-firing gear began to appear on RAF fighters. By the time of the Battle of Britain the eight guns of the Spitfire and Hurricane were all fired by the Dunlop single pneumatic button and cocking units; and with the introduction of 20mm cannon the twin-button selector system followed. Further development during the war produced the Selectric gun-firing switch.

During the war, of course, Dunlop development of wheels and tyres continued unabated; production problems can be gauged by the fact that a heavy-bomber tyre was 17 times heavier than an average car tyre and took 45 times longer to make. Other Dunlop wartime products included rubber dinghies, meteorological balloons, self-sealing fuel tanks and aircraft lifting bags. One notable development was the Franks anti-g suit, first used operationally in the North African landings of November 1942 to make it possible for pilots to make high-speed diving attacks without blacking-out.

Dunlop progress in the post-war years will be well known to the majority of *Flight* readers. In 1946, for example, the plate-type brake succeeded the drum type, and five years later came the Maxaret anti-skid unit to increase its efficiency still further; complete pneumatic systems for aircraft were produced; electro-thermal de-icing systems for aerofoil surfaces were soon followed by adaptation of the same principles for de-icing engine air intakes and other vulnerable points; the Dunlop propeller brake appeared in 1954; another aid to reducing turn-round times was the air-cooled wheel-brake; there was the fusible plug, a safety measure against tyre damage; and in the past two or three years the high-pressure tubeless tyre has been widely adopted for high-performance aircraft. Other products include valves and rams for high-temperature operation; flexible piping; and Maxivue windscreen wipers. Even the missile field has been explored, Dunlop products finding an important place in Firestreak and Blue Steel.

Mr J. Wright, CBE, FRAeS, director

Mr G. A. V. Tyson, OBE, FRAeS, technical sales manager

SOME DUNLOP AVIATION DIVISION PERSONALITIES

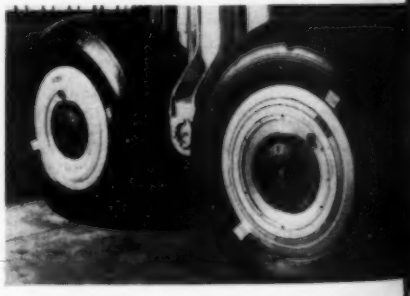
Mr J. Darby, general manager

AVM C. E. H. Allen, CB, DFC, BA, liaison officer

Mr W. H. Sutcliffe, export sales manager

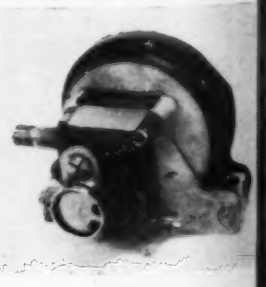
Energy-absorption testing on the Adamson dynamometer

Air-cooled brake installation on a D.H. Comet 4



AWA Argosy undercarriage, with Dunlop wheels, tyres and Maxaret

Close-up of the Maxaret unit, which prevents skidding through over-braking



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Hot Scout, cold Scout: right, the Westland Scout (see Col 2) during preliminary tropical trials in Aden; far right, undergoing simulated cold weather tests in the Vickers-Armstrongs (Aircraft) stratosphere chamber at Weybridge; below right, its Blackburn A.129 engine during cold chamber tests

SERVICE AVIATION

Air Force, Naval and Army Flying News

AAFCE Command

AAFCE (Allied Air Forces Central Europe) is to have a new Commander from next March, Air Chief Marshal the Earl of Bandon, succeeding Air Chief Marshal Sir Harry Broadhurst, who is retiring from the RAF. This appointment was announced in Paris last Friday by General Lauris Norstad, Supreme Commander, Allied Powers in Europe, and simultaneously by the Ministry of Defence in London.

The Earl of Bandon, who is 56, was Commander-in-Chief, Far East Air Force, from 1957 to last year; previously he had been C-in-C 2nd Tactical Air Force, a post giving him exceptional qualifications for his new appointment. He won the DSO on Blenheim operations in the Second World War and also holds the American DFC and Bronze Star.

Sir Harry Broadhurst, 55, was AOC-in-C Bomber Command before going to AAFCE. One of the most famous personalities in the RAF, he was a pre-war aerobatic pilot, commanded Treble One Sqn at the outbreak of the Second World War, was SASO and then AOC, Desert Air Force, and commanded No 83 Group, 2nd TAF, throughout the invasion of Europe. Amongst his decorations are the DSO and Bar, DFC and Bar and AFC.

"Illustrious and Happy Chapter"

IT was D-day—disbandment day—last Tuesday for the eleven fighter control units of the Royal Auxiliary Air Force. From January 31 these units ceased to exist; and in order to pay tribute to the good work their volunteer members have done since the FCUs were formed (the oldest in 1947/48) a farewell guest night was held on January 25 at Fighter Command headquarters, Bentley Priory, Stanmore, Middx.

Air Marshal Sir Hector McGregor, the AOC-in-C Fighter Command, presided—paying tribute to the fine record of service of the fighter control units and expressing regret that "an illustrious and happy chapter" had come to an end—and AVM (ret) F. B. Don, honorary air commodore, RAuxAF, replied on behalf of the FCUs.

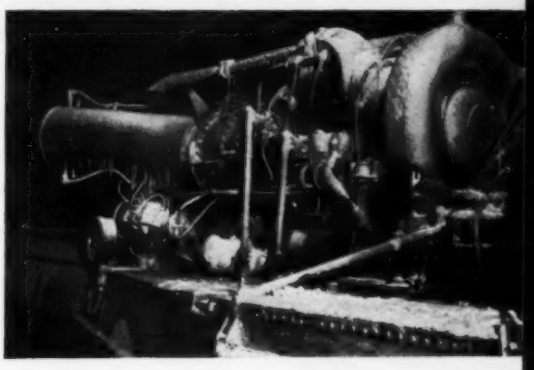
Among the guests were AVM (ret) W. J. Seward, Director of Auxiliaries, Reserves and Air Cadets; Air Cdre (ret) Finlay Crerar, honorary air commodore, No 3612 (County of Aberdeen) FCU, RAuxAF; Air Cdre (ret) G. W. Odey, honorary air commodore, No 3505 (East Riding) FCU, RAuxAF; Gp Capt (ret) J. M. Birkin, Inspector-General, RAuxAF; and the commanding officers of eight of the eleven now-disbanded FCUs—Nos 3505 (East Riding), 3506 (County of Northampton), 3508 (County of Northumberland), 3604 (County of Middlesex), 3609 (West Riding), 3618 (County of Sussex), 3619 (County of Suffolk) and 3620 (County of Norfolk).

The other three disbanded units are Nos 3511 (City of Dundee), 3612 (County of Aberdeen) and 3617 (County of Hampshire).

Scout's Good Report

AFTER tropical trials in Aden, and cold chamber tests at Weybridge, the Westland Scout helicopter has earned itself a good report. It did 19 hours' flying within 12 days under tropical conditions without incurring any unserviceability or occasioning any delay in the programme; and after subjection to a temperature of −35°C its Blackburn A.129 engine was started without difficulty.

The aircraft which went to Aden was flown out intact (apart from the removal of its rotor blades) in a Beverley of RAF Transport Command, so it was ready for flying a short time after arrival. Trials to which the Scout was subjected were designed to obtain preliminary information on hot-weather performance, and to investigate erosion problems (affecting rotor blades, airframe and engine components) under sandy conditions: the programme formed a preliminary to full tropical trials, which are due to start in the middle of this year. The pilot was Maj L. T. Furnivall, RA, of "D" Sqn, A & AEE, Boscombe Down; and servicing was carried out by personnel from the Saunders-Roe division of Westland Aircraft at Eastleigh. The Scout was flown back to the UK in a Bristol Freighter, having had its rotor hub and secondary gearbox, undercarriage and rear fuselage removed before being put aboard the aircraft.



At Weybridge, the Scout was subjected to functional tests in simulated snowstorms and high-wind conditions in its cold chamber trials, a full servicing programme being carried out by a team from the Central Servicing Development Establishment under Capt C. R. Collier, REME. The establishment, whose headquarters are at Dereham, Norfolk, have a resident team at Eastleigh.

The Scout was originally designed and built—under the designation P.531—as a private venture, and prototype aircraft had flown before an MoA contract was received in June last year. Five aircraft of the development batch have now flown and a further three are in an advanced stage of production.

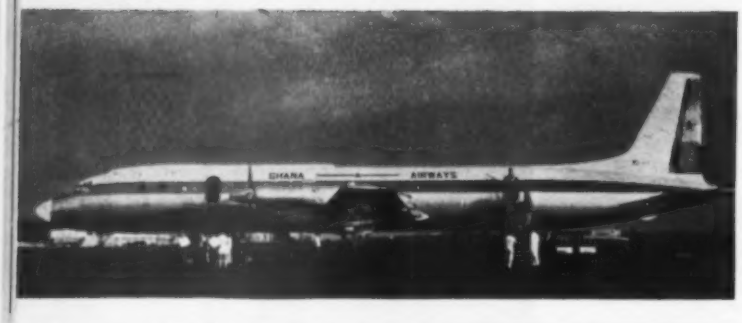
Two of the fighter control unit COs at the farewell guest night referred to above: at left, Sqn Ldr L. E. W. Webb, OC No 3506 (County of Northampton) FCU; centre, Sqn Ldr D. A. G. Parry, OC No 3620 (County of Norfolk) FCU. With them is Wg Cdr G. M. Shinnie, a Fighter Command HQ staff member

IN BRIEF

No 3612 (County of Aberdeen) FCU, one of the recently disbanded RAuxAF fighter control units, received the No 3 Group efficiency trophy at its final parade on January 22.

The new station commander at RAF Khormaksar, Aden, is Gp Capt J. F. Davis, OBE, DFC, AFC, formerly Assistant Commandant at the RAF Flying College, Manby. He succeeds Gp Capt J. R. H. Merifield, DSO, DFC, AFC.

A record supply drop—seven and a half tons of food, medicine and other supplies delivered in the space of 5¼hr—was carried out by a Valetta of No 52 Sqn in Malaya recently. Captained by the squadron commander, Sqn Ldr Geoffrey Moss, the aircraft flew from Butterworth to supply Malayan Police in jungle forts and New Zealand troops patrolling the border area.



Ghana is buying new aircraft from Britain, from Russia and from the United States. Seen at Dakar Airport Senegal (upper left), is one of the airline's six new Il-18s. Below is an artist's impression of a VC10 in Ghana Airways colours (see note on this page)

COME IN TO LONDON AIRPORT

LONDON Heathrow has long been closed to single-engined aircraft, and since last August—except by written application sent 24hr in advance of arrival, and listing a string of reasons for wanting to fly in—Heathrow has been closed to all non-scheduled flights as well. It is believed to be the only airport in the world to impose such stringent restrictions, which have been as much criticized for their restrictive effect on airport utilization as has the decision to increase landing fees.

Representations made directly to the Minister appear now to have been in part accepted, and there are signs of some amelioration in the Ministry's attitude to casual visitors to Heathrow's runways. Mr J. V. Hose of Business Aviation has received from the Ministry a letter stating that (1) there will no longer be a complete ban on single-engined aircraft "if they are of modern type and able to meet equipment requirements," and (2) "there will no longer be a requirement for written approval 24hr in advance," but to avoid disappointments a request for prior permission should be made to London (Heathrow) Airport as far in advance as possible.

These vital concessions are contained in a letter which includes certain other conditions, and Mr Hose feels that their true value may not become apparent until the necessary amendment to information circular No 81 of 1960 has been made. He understands that arrangements for this have been put in hand.

AIR COMMERCE

GHANA CHOOSES VC10s

FIRST export order for one of Britain's second-generation jet transports came on January 24 from the Ghana Government, who placed on behalf of Ghana Airways a firm order with the British Aircraft Corporation for three Vickers VC10s. The order specifies aircraft of the basic VC10 type (of which BOAC originally ordered 35 and of which the corporation will probably now have 15. BOAC's remaining 20, plus ten of the now revised Super VC10, will probably be a smaller developed VC10).

Ghana Airways, as noted in *Flight* for January 13, have been considering both the VC10 and the Boeing 707 to fulfil their future long-haul aspirations. Boeing as well as BAC representatives were in Accra at the same time negotiating with the Ghana Government. It is believed that Ghana may still have Boeings as well as VC10s: the choice of American jets appears to be between the 707-420 (Rolls-Royce Conways) and the 720B (Pratt & Whitney JT3D turbofans), with Boeing reportedly recommending the 720B and Ghana at the moment preferring the 707-420.

It is unlikely that either the Boeing 707 or the Vickers VC10 is being selected by Ghana primarily on economic merit; the Ghana Government regards the economics of Ghana Airways as secondary to "the imponderable benefits" which Ghana Airways will bring "to Ghana's prestige overseas and to our international trade generally" [Mr Krobo Edusei, Minister of Transport, February 1960]. Since independence the Ghana Government has ordered six Ilyushin Il-18s, two Britannias, and three Viscount 838s, the latter for delivery between May and July this year.

Nevertheless, an export order for Britain's aircraft industry worth some £7m (the exact value of the contract has not been disclosed) is no less valuable for being primarily a prestige order. Furthermore, by the time that the VC10s are delivered to Ghana in about three years' time, these aircraft—which will probably be used to link Ghana with Europe and the Middle East—may well prove to have been the best big-jet choice on economic grounds. And the link between Ghana and the British Aircraft Corporation, already assured by orders for Britannias and Viscounts, and by such small but significant factors as the training of young Ghanaian engineers by BAC (fourteen of them arrived last week), will be assured for many years ahead.

AMERICAN AIRLINES 707 TRAINING FATALITY

AS *Flight* went to press few details were available about the accident on January 28 to an American Airlines 707 off the eastern tip of Long Island. The aircraft, on a training flight, apparently went out of control with one of its engines on fire and crashed into the Atlantic six miles east of Amagansett, Long Island. The six occupants, all instructors or trainees, were killed Debris was scattered over two miles of beach.

A subsequent report, attributed to an American Airlines spokesman, told of the aircraft practising manœuvres such as "stalls and rapid descents."

TRAIN NOW, PAY LATER

IN May of this year Air Schools Ltd, at Elstree and Derby, are to introduce in conjunction with United Dominions Trust a scheme whereby a substantial part of the cost of a commercial pilot's licence and instrument rating is deferred until the course is completed.

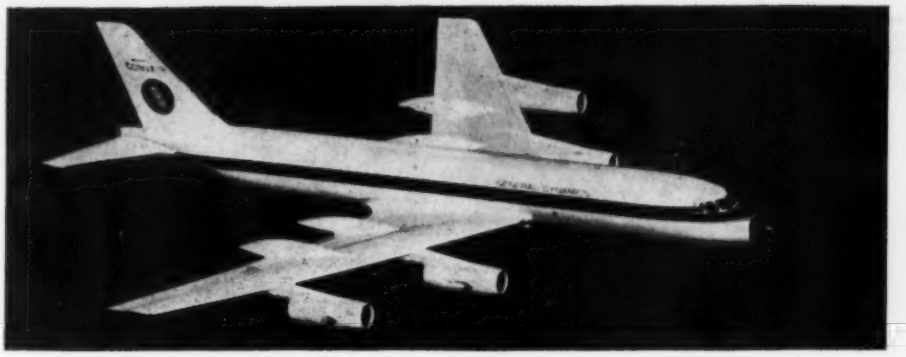
There is no guarantee that employment will be found for those who pass-out successfully, and the maximum possible loan falls short by £500 of the likely maximum cost of training, examinations and accommodation. A string to the normal maximum loan of £1,385 is that repayment is over three years from one month after *commencement* of the course, so that the airline pilot trainee—or his parents or guarantors—will have to find during the nine- or ten-month training period the residue of the £1,800-£1,895 total fees and about £460 in repayments—say £1,000 in all.

Alternative UDT schemes provide for loans of either £1,000 or £500 at six per cent interest, each repayable from twelve months after the beginning of the course. The lesser sum is intended to assist partly qualified pilots to complete their training, or for students who need assistance in finding the final 25 per cent of the fees. Monthly repayments are £25 18s 9d over two years on the smaller loan and £51 17s 6d on the larger.

From the trainee's point of view, a safeguard is that the deferred-payment scheme does not begin until after the pupil has trained for, and obtained, his private pilot's licence at his own expense. The fees for this are about £180-£240, depending upon ability, and this sum will be demanded only after the candidate has passed the Air Schools selection board and has proven his determination to become a professional pilot. A licensed private pilot will be required to undergo ten hours' grading flying at his own expense and obtain a certificate of satisfaction from the chief flying instructor of either the Elstree or Derby Schools of Flying before he is given approval to train on a repayment-from-salary basis. In every case and before any flying training is embarked upon UDT will examine the credit-worthiness of every applicant.

Subsequent to obtaining a PPL the candidate embarks upon the most expensive part of the course—flying training for a commercial pilot's licence and instrument rating. The fees are broken down as follows: CPL and rating, £1,150; ground training including notes, £85; messing and accommodation, £270; MoA examination and test fees, £100; insurance covering life and loss of licence, £50.

Training at Elstree or Derby is to be carried out on Chipmunks, Auster J1Ns will be used for cross-country flying, and an Apache for twin conversion. Air Schools Ltd say that they can "state quite categorically and with a clear conscience that we are the only organization in England other than the College of Air Training at Hamble, to provide a fully integrated course of training for a CPL and instrument rating while offering full classroom tuition as well as flying facilities." (Airwork Services Training, of course, is at Perth, Scotland.) Another advantage claimed is



A new variation on "she handled beautifully" was used by Convair chief test pilot Don Germeraad about the maiden flight on January 24 of the Convair 990. After taking off from Lindbergh Field, San Diego, for a two-hour flight before landing at San Diego Naval Air Station, Mr Germeraad said that it was "the cleanest first flight I have ever flown." Four 990s are to be used in the flight test programme

that the Air Schools courses are less expensive to the individual than those at the College, since students can be earning a second officer's salary less than a year after first stepping into an aeroplane.

Grading of the first students will take place on May 2 and a further batch (for which applications may be received up to March 14) will start on May 28. Only full-time pupils are accepted and training, not necessarily to choice, will take place at either Elstree or Derby. An advanced course starts on June 28 at Elstree, where flying training will be under Mr John Schooling, CFI of the London School of Flying. Instruction at Derby will come under Mr Denys Stuart, CFI of the Midlands School.

BOAC COMET INCIDENT AT ROME

CONFLICTING reports have been published about the incident to BOAC Comet 4 G-APDM (Capt R. E. Harwood) near Rome on January 25. According to an early newspaper report, the aircraft—which was operating BOAC flight BA 115 from London to Johannesburg calling at Rome, Khartoum, Nairobi and Salisbury—"shaved the top of a pine tree when two miles from the [Fiumicino] runway." Later, however, the Italian newspaper *Il Messagero* (as reported by the *Sunday Express*) said that it was "a miracle there was not a major disaster." According to this source, the trees hit by the Comet were on Monte Cimino, about 40 miles north of Rome. Police had reported finding "pieces of aircraft." According to the Italian newspaper the Comet advised Rome control that it was over the Civitavecchia NDB (see map) while in fact it was actually over Bolsena NDB, about 60 miles NW of Rome. Mistaking Bolsena beacon for Civitavecchia, said the report, the Comet pilot lowered his undercarriage and began his approach.

Damage was caused, according to *Lloyds List*, to the nose-wheel, main undercarriage and flaps (see photograph). The aircraft landed safely at Fiumicino (which had been opened only ten days previously) and none of the 44 passengers, among whom was the former Minister of Aviation, Mr Duncan Sandys, was hurt.

A BOAC spokesman was last week unable to comment on these reports as an official investigation is under way. The investigating team, comprising BOAC and Ministry of Aviation officials, was reportedly on the scene only ten hours after the incident.

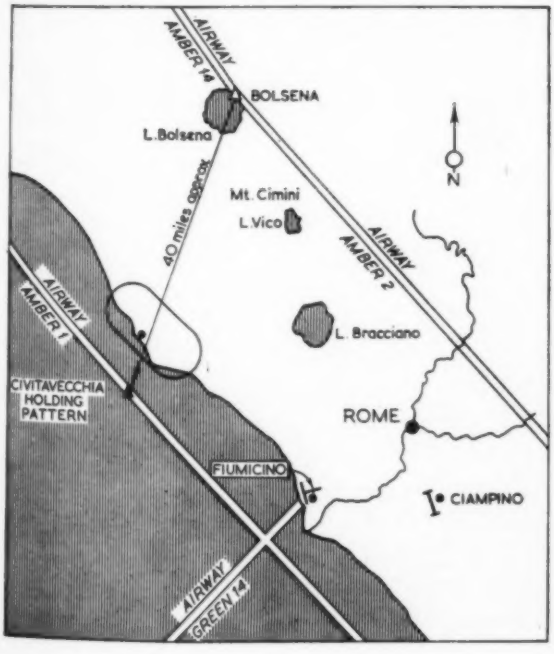
This was the fifth incident to a BOAC Comet 4 in the landing or approach phase since June 1959. The facts are as follows:—

(1) On June 9, 1959, G-APDA overshot the runway at Calcutta Dum Dum, having hit a tree on its first approach, causing damage to the flaps. On the second approach the aircraft overran the wet runway. There were no injuries. The accident was attributed by BOAC to pilot error.

(2) On June 21, 1959, G-APDB struck a 10ft steel jet blast barrier while landing in daylight and perfect visibility at New York International. Damage was caused to the flaps and undercarriage but the aircraft landed safely and there were no injuries. The incident was attributed to pilot error, a contributory cause being a sudden down-draught of unexpected severity.

(3) On December 23, 1959, G-APDL landed with its wheels retracted at Rome Ciampino. There were no injuries. The accident was attributed to pilot error.

(4) On March 14, 1960, G-APDS hit high ground whilst circuiting to land at Barajas Airport, Madrid. Whilst at a distance of about two miles from Runway 23 the aircraft struck the top of a ridge 345ft above airport level and both main bogie wheel assemblies and the port pod tank were torn off and two engines stopped. The aircraft was landed successfully without injury to the occupants. The accident was attributed to pilot error.



RECORD IRISH YEAR

DURING the twelve months ending on December 31, 1960, Aer Lingus-Irish International Airlines carried a larger volume of traffic than ever before. On the European and United Kingdom routes the airline lifted 681,000 passengers—an increase of 23 per cent over 1959—and 12,700 tons of cargo and mail. The North Atlantic routes showed an even more spectacular increase over the 1959 figures, for passenger traffic rose by 46 per cent to 33,500 and cargo and mail traffic more than doubled.

An incident involving a BOAC Comet 4 near Rome last week resulted in the damage depicted below, despite which the aircraft landed safely at Fiumicino without injury to the occupants. The map and the note on this page provide the background to the incident, the causes of which are being investigated

Air transport's missions of mercy to the needy have on several occasions been the subject of pictures in these pages. Here aid is being given to relieve starvation in the Congo. (Left) Wheat and maize for the Kasai province is loaded into a Swissair DC-6 at Salisbury, S. Rhodesia, and (right) a Sabena DC-6 at London loads Complan, a British food powder donated by Glaxo Laboratories, en route to Brussels and Bakwanga

AIR COMMERCE . . .

US AVIATION'S NEW BOSS

ONE day prior to his inauguration as President of the United States Mr Kennedy announced his selection of the man who is to become administrator of the Federal Aviation Agency—one of the world's most responsible aviation jobs. He is Mr Najeeb (Jeeb) E. Halaby, a Los Angeles lawyer and financier, and a practising pilot. Little known in Europe, and by no means a public figure in the US, the man who is to fill Elwood Quesada's shoes has risen steadily in rank and status since, as a lieutenant in the Navy in 1945, he flew the first jet across the American continent.

Mr Halaby is 45 and has been a private pilot since 1933. He was a Lockheed test pilot in 1942-1943 and a US Navy test pilot until 1946. Then, for two years, he was aviation intelligence adviser to the State Department; and in 1948 he became Deputy Assistant Secretary of Defense. In 1953 he received the Arthur Flemming award as "the outstanding young man in federal service."

Najeeb Halaby also had some hand in the birth of the FAA; between 1955 to 1957 he served as vice-chairman to William B. Harding on the White House Aviation Facilities Study Group. He is now a director of the Flight Safety Foundation, Society of Experimental Test Pilots and Quiet Birdmen.

In his announcement of the appointment Mr Kennedy said: "During the next few years one of the most challenging jobs in the federal service will be to minimize the perils of the airspace and to go forward in developing the great prospects for aviation.

"We have looked for the best qualified and professionally competent man. We have found him in Jeeb Halaby of Santa Monica. He reports directly to me and will be my principal aviation adviser and administrator of the Federal Aviation Agency."

TAA BREAKS ALL RECORDS

TWO facts stand out like landmarks in the recently published report for Trans-Australia Airlines for the financial year ended June 30, 1960. For the first time TAA carried more than one million passengers in a year. And with this surge in business came a record profit of £A¼m.

Last year's growth in traffic was based upon a sharp expansion of TAA's tourist-class passengers; this category of traffic appears to have more than trebled in 1959-60 compared with the previous twelvemonth. In contrast, the volume of first-class traffic fell. (Precise figures for passengers and passenger-miles for each class of passenger cannot be established from the contradictory evidence in the report.) The net effect of this was that passenger traffic as a whole increased by almost 25 per cent to reach 532m passenger-miles. Mail traffic increased even more rapidly—by a remarkable 65 per cent—as a result of the government's decision to move all first-class mail by air without surcharge. Nevertheless, the total volume of mail traffic was still slight at only 1¼m ton-miles. By contrast, the volume of freight remained virtually unchanged at the 10m ton-miles level that has prevailed over the past three years.

The overall traffic increase of 21 per cent was accompanied by a 24 per cent rise in capacity to reach the 100m c.t.m. mark for the first time. The resulting drop in load factor, together with a slight fall in average revenue rates would normally have been sufficient to have transformed TAA's narrow profit into a loss. However, by reducing unit costs by four per cent the remarkably low level was achieved of 34 pence per c.t.m. (UK equivalent 28 pence per c.t.m.). This had the effect of raising the net profit from £A¼m to £A¼m. Main credit for this cost reduction appears to be due to the fuel companies. Engineering and ground expenses also showed economies; depreciation, on the other hand, showed a sharp increase.

Despite eight years of unbroken profitability, the airline's balance sheet is strangely disappointing. Like many government-owned airlines TAA finances its activities to a large degree out of short-term borrowing; current liabilities exceed current assets by several million pounds. A more serious aspect of the balance sheet is the large amount of capital tied-up in relation to the volume of business: if allowance is made for the chronic dependence upon short-term finance, it is seen that the airline fails to pass the acid test of managing to turn over its capital once in a year. Part of this failure can be explained by the fact that TAA is at the beginning of an expensive investment cycle. Another factor is that the airline appears to have depreciated its aircraft rather slowly in the past; this would have had the effect of inflating the values shown against fixed assets (thus exaggerating the amount of capital tied up in the business) and realizing profit figures higher than would otherwise have been the case. It is unfortunate that no information concerning depreciation policy is given, for in its absence it is difficult to evaluate the financial progress of this technically excellent airline.

WHILE ANSETT GROWS AND GROWS

A BRIEF announcement on page 129 of *Flight* last week that Ansett had acquired Mandated Airlines, Madang Air Services and Gibbes Sepik Airways, raises the question of the future of Papuan Air Transport, the only remaining independent operator in the Papuan and New Guinea area. Operating from Lae and Port Moresby with two Piaggio P.166s, this independent has generated sufficient charter business to place an order for a third aircraft.

It remains to be seen if Papuan stay outside the fast-growing Ansett-ANA group, for it is already rumoured by reliable Australian sources that talks of a preliminary nature between Papuan and Ansett have been hanging fire until the position *vis-à-vis* Mandated was cleared. It would not be surprising, in view of discussions about increasing self-determination for the territory, if Ansett does not shortly apply through Mandated Airlines for routes from New Guinea to surrounding areas. Plans are in hand to extend the Mandated fleet by the addition of two Piaggios, the first of which may be delivered this month through Bristol Aircraft (Australia) Pty Ltd, the local agents.

Ansett Transport Industries have acquired from the three operators—all subsidiaries of W. R. Carpenter Holdings Ltd—21 aircraft, comprising nine DC-3s, two Ju 52s (formerly operating with Finnair), three Norsemen, five Cessnas and two Rapides along with Mandated's valuable land and buildings. As a result of the take-over W. R. Carpenter Holdings becomes the largest single shareholder in the Ansett group.

DEVONAIR'S NEW VENTURE

A NEW project at Coventry Airport is to be undertaken by the British independent Devonair, who have taken over from the now-defunct Orion Airways that independent's Coventry base and equipment. No exchange of aircraft was involved. The ex-Orion facility is to be used for light-aircraft maintenance, and the airline may start a flying school at Coventry to be known as either the "Centre-of-England School of Flying" or the "Coventry School of Flying." An executive charter service may also be operated and Devonair are interested in the possibilities of both helicopter operation and maintenance. The school and executive service will be operated with Tri-Pacers, Chipmunks and a Comanche.

Devonair operate between Chivenor and Lundy Island a seasonal non-scheduled passenger and freight service with a D.H.90 Dragonfly and a Miles Aerovan. The latter is the only aircraft of its type now operating in Great Britain but it has the advantage of being the only one which can carry a three-quarter-ton freight payload into and out of Lundy while meeting the Air Registration Board's Schedule D requirements for critical engine failure.

Managing director of Devonair, and the man responsible for the new Coventry project, is Mr Maurice Lucker.

LANDING FEES: THE AIRLINES PROTEST

NOT for many years, if indeed ever, has IATA delivered such an outspoken attack on a Government as last week's protest about UK landing fees delivered to the Minister of Aviation by Sir William Hildred, IATA's director general. The protest, that the Government should change its plans to increase fees by 33⅓ per cent on April 1, was rejected by Mr Thorneycroft.

Words picked out of context from the IATA statement such as "shocked" and "disastrous" do in fact reflect the feelings privately expressed by the 40 airlines using London, including BOAC and BEA, since the increases were announced last autumn. Pointing out that UK landing fees are already "virtually the highest in the world," the airlines say that the proposed increases will take them to a level "far above that of other principal airports." Examples quoted for an intercontinental Boeing 707 or DC-8 are as follows:—

London, £181 (£240 proposed); New York International, £122; Paris, £115 (night); Rome, £102 (night); Copenhagen, £74 (night); Frankfurt, £71; Zurich, £58 (night); Amsterdam, £50 (night); San Francisco, £26; Chicago Midway, £22; Los Angeles, £5.

Five of the airports listed above have more movements and handle more passengers than London.

The airlines say that the proposed charges are "entirely disproportionate to the amount of traffic involved" and that one world-wide carrier (un-named) will be paying about 20 per cent of its total landing fees to London Airport, a place which accounts for only five per cent of its aircraft movements.

The airlines fear that other countries might follow the UK lead, with effects which would be "potentially disastrous" to air transport. They find it difficult to reconcile "a policy of repeated increases" [UK landing fees went up 15 per cent in June 1957 and a further 28 per cent in April 1959] with the Minister's policy of insisting upon "drastic fare reductions."

Inevitably IATA make their usual point about the value of airports to the nation's tourist industry, remarking that in 1959 700,000 visitors arrived in the UK by air and spent £65m in Britain. Less valid perhaps is the IATA assertion that costs arising from technical services, administration and interest should not be paid for by the airlines. According to "widely accepted international practice," says IATA, "these items are not normally charged off by governments to airlines." Whether or not IATA has made a full survey of international practice is not known, but what they must really mean is that the levels of these items of expenditure are not so high in the case of other airports. What IATA seem to be saying in effect is that these cost items should be met by subsidies, and that the taxpayer owes the airlines a living in respect (for example) of ATC services—a suggestion which the airlines cannot really expect to be taken seriously.

It is thus not quite right for IATA to subtract such costs from London and Prestwick accounts and to declare that these airports are "profitable now and will become more so," according to what the statement calls "the concept of airport costs used elsewhere."

It is one thing to say that the cost of UK airport administration, interest and technical services is too high; it is quite another to say that this cost should not be charged to the users of airports. And if *Flight's* analysis of the UK airport accounts (last week's issue, page 105, where it was suggested that the real loss last year was more like £13m than £5½m) is accepted then by no stretch of the imagination or manipulation of figures could London and Prestwick be shown to be profitable.

One point that is made most strongly by the airlines, and which must be completely accepted by the Government (who asked for IATA's views on the subject) is that "other sources of revenue at UK airports, particularly London, have been neglected." The statement notes that only nine per cent of total UK airport revenues came from such sources in 1959-60 whereas "certain US airports . . . collected 50 per cent and more of their total revenue from concessions and other non-aviation sources."

Hinting obliquely that London Airport may lose traffic as a result of the proposed increases, the airlines say that "such a policy [of increasing landing charges] is inconsistent with the aim of attracting increased traffic."

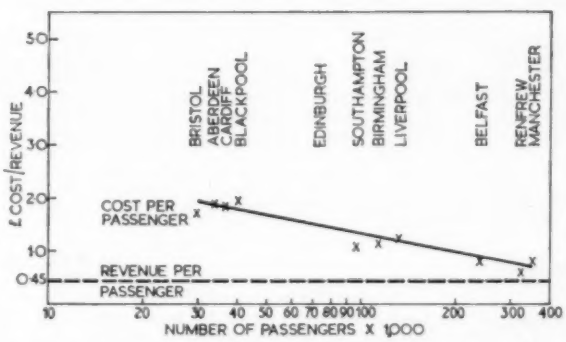
Certainly, as the graph below illustrates, the cost level of an airport decreases with utilization. Here perhaps is the real weakness of Britain's airport economy—under-utilization. It would be the aim of the new autonomous airport authority which may yet take over the running of Britain's airports (a step which the IATA statement specifically recommends) to remove this weakness. There are already hopeful signs (page 162).

MoA AIRPORTS, 1959-60: REVENUE AND EXPENDITURE

(All figures shown in £ million and rounded off)

	Heathrow	Gatwick	Prestwick	Others	Total 1959-60	Total 1958-59
Expenditure:						
Staff	2.0	0.4	0.4	1.3	4.1	3.7
Interest	1.3	0.4	0.2	0.6	2.5	2.6
Depreciation ...	0.9	0.2	0.1	0.5	1.7	1.7
Maintenance ...	0.4	0.1	0.1	0.6	1.2	1.2
Overheads ...	0.2	0.1	0.1	0.4	0.8	0.5
Water, power ...	0.3	neg	neg	0.3	0.6	0.6
Others	0.9	0.2	0.3	0.6	2.0	1.8
Total expenditure ...	6.0	1.4	1.2	4.3	12.9	12.1
Revenue:						
Landing fees ...	2.0	0.1	0.4	0.6	3.1	2.1
Rents, etc. ...	1.4	0.1	0.1	0.6	2.2	2.1
Apron services...	0.6	neg	0.1	0.1	0.8	0.8
Pass. services ...	0.5	neg	neg	0.1	0.6	0.4
Sundries ...	0.4	neg	neg	0.1	0.6	0.3
Total revenue: ...	4.9	0.3	0.7	1.4	7.3	5.7
Deficit:						
1959-60	1.1	1.1	0.5	2.9	5.6	6.4
1958-59	2.1	0.9	0.6	2.8	6.4	—

This is how BEA's Comet 4B stewardesses look when they disembark at Moscow during the present winter season. Last winter only stewards flew this route. The girls board at London in their normal uniforms, making a quick change into ski pants, lambswool lined boots, fur earmuffs and fur-lined raincoats before arrival in Moscow

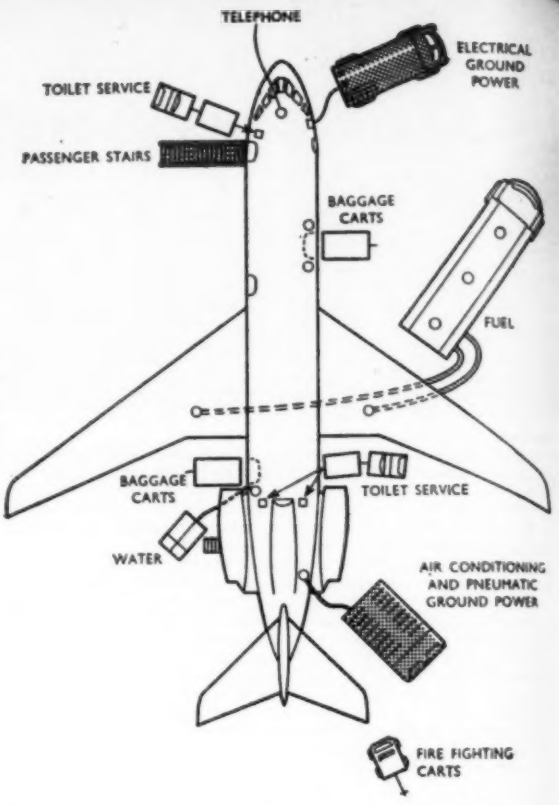


At left is a summary of the essential financial situation. Above, based on the Report of the Select Committee on Estimates, 1956-57, is cost and revenue per passenger at UK provincial airports plotted as a function of passengers handled

POWERS OF DEPRECIATION

ONCE again the US Civil Aeronautics Board is asking Congress to give it authority to regulate airliner depreciation-rates. When the CAB previously tried to do this it was eventually overruled by a judgment of a US Court of Appeals. Now the Board is returning to the attack, notwithstanding the dissent of one member (Mr Chan Gurney) who believes that depreciation practices are "primarily a function of management" and that "any regulatory supervision constitutes an unnecessary interference with the operation of an air carrier."

The CAB feels that without reliable information about depreciation it cannot appraise the true financial condition of the airline industry. It considers that improper depreciation charges can undermine the financial picture in "exactly the same manner as inaccurate charges for salaries, rent and other operating expenses." It considers that errors in the reporting of depreciation "tend to accumulate over a period of years and are difficult to correct in the accounts of carriers once the inaccuracies become rooted over an extended period of time."



This drawing, reproduced from the "de Havilland Gazette," shows the manner in which servicing vehicles are disposed around the Trident during turn-round. Unlike the Boeing 727, which has provision for rear loading, the Trident's two passenger entrances are ahead of the wing

AIR COMMERCE . . .

HERE WE GO AGAIN

WITH the exceptions only of Copenhagen, Stockholm, Geneva, Hamburg and Berlin, each of seventeen Cunard Eagle applications to serve Europe, now before the Air Transport Licensing Board, parallel those recently submitted by BUA. A fine distinction is that while BUA has applied to operate out of Gatwick, Cunard Eagle stipulate London Heathrow Airport. Applications have also been made to operate to Dublin and Nice from Manchester or Liverpool.

While Cunard Eagle's applications are less numerous than those put in by BUA, frequencies demanded are slightly higher, no less than 21 services a week, for example, being asked for on the route between London and Paris. Amsterdam, Brussels, Dublin, Dusseldorf and/or Frankfurt, Venice, Milan, Copenhagen and/or Stockholm, Barcelona and/or Palma and Basle are all regarded as places to which a daily service could eventually be operated. A characteristic of the applications is the very broad interpretation placed upon a common traffic area in applications to operate on such routes as London to Rome and/or Athens and/or Istanbul. No request has been made for British domestic services.

Eagle stipulate Viscounts, DC-6s and Britannias for initial operation at a lower frequency but, like BUA, who have said that they would buy VC10s and Tridents if their applications were granted, Eagle's anticipated support of the British aircraft industry is made manifest in its declaration to operate on these routes Vanguards, Tridents and [*sic*] VC11s if they receive the necessary licences.

It was suggested earlier that some £3,100—the price of BUA's sweeping applications for European and African route licences—was perhaps not a lot of money if it established BUA in the minds of competing independents as Britain's prospective No 2 European operator. Eagle's only slightly less expensive applications clearly challenge this view.

BEA COMET FLAP

WHILE carrying out his take-off check at London on January 24 prior to a flight to Geneva, the pilot of a BEA Comet 4B noted that there was a discrepancy in the readings of his two flap indicators. One read 40°, the other 20°, so he returned for a check. The fault was traced to an electrical source, and during the course of this inspection it was fortuitously discovered that one of the main flap hinge-brackets was cracked.

All seven BEA Comet 4Bs at present in operation, and four Olympic 4Bs, were immediately checked, and hinge brackets on three other BEA aircraft were found to be cracked. Four aircraft were withdrawn from service for replacement of the faulty components. A number of BEA Comet 4B services were last week operated by Viscounts and Vanguards.

It is thought that though BEA's Comet 4Bs have a higher rate of take-off and landing per flying hour than those of other operators (less than two flying hours per landing compared with more than three for BOAC), the cause of the cracks does not appear largely a function of this fact (as was the cracking of nosewheel axles discovered last November). Being investigated now is the possibility that the Comet 4B's air brakes, which unlike those of the Comet 4 and 4C extend over the flap hinge brackets, cause unusual buffeting loads to be imposed on these components.

Meanwhile DH have redesigned the brackets, and modified components are being fitted. The first is due to be installed as this issue appears.

BREVITIES

The six Handley Page Heralds on order by Jersey Airlines will, the airline announces, be equipped with Mk 10 Decca Navigators.

A DC-3 of Capitol Airways under contract to the USAF on an all-cargo flight on January 23 crashed 30 miles west of Houston following an engine fire. Both pilots were killed.

Delivery of Riddle Airlines' seven Argosies and seven DC-7Fs will be complete by the end of March. The airline already has three Argosies operating the USAF MATS "Logair" contract.

The FAA has ordered a Boeing 720 for training flight-safety inspectors to the "same skill as the airline pilots whose operations they monitor." It is the 338th Boeing jet airliner sold.

Air-India inaugurated 707 services to Tokyo on January 25 when the first flight left Bombay with a party of Government officials, MPs and guests on board. This route will be operated as part of the BOAC/Qantas/Air-India tripartite pool agreement.

Loftleidir has introduced a 17-day excursion fare on the London - Reykjavik - New York route. Using DC-6Bs the new fares offer a saving of more than £9 compared with the lowest IATA propeller 17-day fare and, according to Mr Robert E. Delany, Loftleidir's North American president, thus the airline continues to cater for that "large segment of the travelling public interested in saving money rather than a few hours of time."

Mr Anthony Milward, chief executive of BEA, arrived in New York on January 28 at the beginning of a three-week tour of the USA, during which he will open a new ticket sales office in Chicago. The corporation already has offices in New York and Los Angeles. At Seattle on February 10 he will inspect design and production preparations for the Boeing 727, an opportunity "especially welcome in view of the strikingly similar final design studies . . . concluded independently" by Boeing and de Havilland, from whom BEA have ordered 24 Tridents.

Guest Aerovias opened a Comet 4 service between Mexico City and Miami on January 19.

It is reported that Cathay Pacific Airways is planning to introduce jet airliners in place of its Lockheed Electras, and that the Boeing 720 is at present favoured, though the VC11 and D.H. Trident are being considered also.

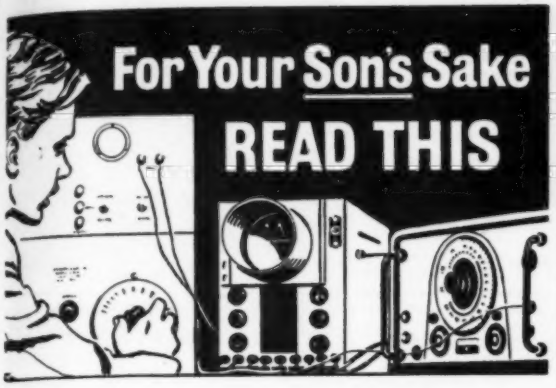
On June 1 Air France are to introduce a direct Caravelle service linking Manchester with Paris. The French airline operated a Manchester - Paris service after the war but discontinued it in 1955 due to a shortage of Viscounts.

The American FAA has asked the airlines for comments on proposed new legislation to ensure safety when taking off in slush. The proposed legislation places responsibility on the airline for measuring the depth of slush and adjusting take-off weight accordingly.

As forecast in *Flight* for October 7, page 562, BOAC's South American service has made a profit since it was re-opened—with some doubts about its profitability—on January 25, 1960. To date more than 21,000 passengers have travelled between London and Santiago.

A DC-3 of Garuda Indonesian Airways crashed on a flight from Djakarta to Bandung on January 25. The wreckage was found on Mount Burangrang twelve miles north-west of Bandung. Early reports stated that there was no sign of life. There were 21 passengers and crew members on board.

BOAC's Boeing 707 services to the USA will not use Manchester for a period of two or three months from February 6 whilst work on the 500ft runway extension (present length 6,800ft) is in progress. Passengers will be flown by DC-7Cs to Prestwick. Sabena say that they intend to continue to operate 707 New York services through Manchester during the extension work.



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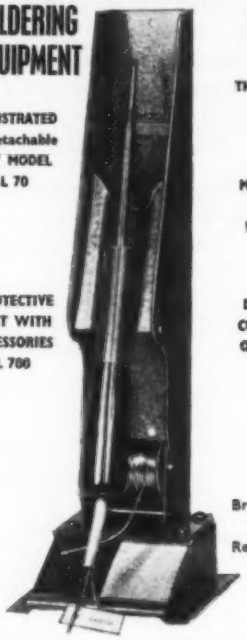

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